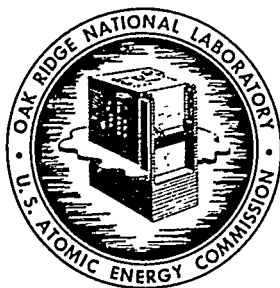


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65-1-57

DATE: January 28, 1965

SUBJECT: Radioactive Waste Disposal Operations
Report for December, 1964

TO: Distribution

FROM: L.C. Lasher

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INVENTORY OF TOTAL ACTIVITY DISCHARGED

Table 1 is a summary of data obtained from a network of stations which monitor Laboratory waste effluents. The physical locations of these stations are shown in Figure 1. Figures 2 and 3 compare the release of radioactive waste on a monthly basis. Figure 4 shows a comparison of the volumes of liquid wastes handled.

A total of 17 curies of radioactivity was discharged into White Oak Lake this month. The bulk of this was ruthenium which seeped from the waste pit disposal areas. The strontium release was 420 millicuries; 370 millicuries of this amount came from the Bethel Valley area.

The 300 millicurie difference between the total strontium measured at stations 1 and 2 and that measured at station 3 is more apparent this month because of the low discharge from the process waste system measured at station 1. The difference, however, is not unusual. During the year 1964, the average monthly difference was 270 millicuries.

The average monthly release of strontium to White Oak Lake in 1964 was 600 millicuries as compared to an average of 800 millicuries in 1963. In 1964 the process waste discharges (station 1) accounted for 250 millicuries, or 42% of the total. Another 20 millicuries per month, average, was measured at station 2 and 60 millicuries at station 4 to account for 330 millicuries or 55% of all strontium released to White Oak Lake. The balance of 270 millicuries, cannot be accounted for by measurements made at the monitoring stations and appears as the difference between the total measured at station 1 and 2 and the

measurement at station 3. It is estimated that approximately one-half of the 270 millicuries was released from known sources, such as the laundry (probably less than 10%) and storm sewers, that are not routinely sampled, and it is speculated that the other half came from the creek bed itself--from old deposits left there years ago when the Laboratory releases were relatively high.

PROCESS WASTE TREATMENT AND DISCHARGE TO WHITE OAK CREEK

A total of 13.3 million gallons of waste carrying 250 millicuries of radioactivity was discharged into White Oak Creek. The process waste flow did not exceed plant capacity this month and it was possible to recycle part of the plant effluent at a continuous rate of 50 gallons per minute. As a result, the decontamination achieved by the plant continued to be very good (Table 2). This was made possible by the separation of 4500 area waste so that the contaminated waste could be treated more intensively.

The principal sources of waste discharged into the system are listed in Table 3. An additional 6.1 million gallons of waste from the 4500 area were discharged directly to the creek and are not included in the table.

INTERMEDIATE-LEVEL WASTE

A total of 315,890 gallons of waste was pumped to the soil disposal area this month. Distribution between the trenches was as follows:

	<u>Gallons</u>
1. Trench 5	182,850
2. Trench 7A	63,320
3. Trench 7B	69,720

Major contributors to the system were as follows:

	<u>Gallons</u>
1. Building 3019	59,610
2. 4500 Complex	51,510
3. Reactor Complex	45,640
4. Radioisotopes Processing Area	23,470
5. Fission Products Development Laboratory	16,660

The waste from the Fission Products Development Laboratory is currently stored separately at the South Tank Farm for possible future reprocessing.

Seep streams draining the Trench 5 and Trench 7 areas were sampled during the month. Estimates of discharges of several nuclides are tabulated below:

<u>Nuclides</u>	<u>Curies Discharged in 31 Days</u>
1. Strontium 89-90	3.6×10^{-5}
2. Cesium 137	2×10^{-3}
3. Ruthenium 106	2
4. Cobalt 60	1

Table 4 is an inventory of the nuclides transferred to the soil disposal area.

GASEOUS WASTE SYSTEM

The total discharge from the air handling systems was 1.9 curies. The activity was practically all I^{131} released from the 3039 stack. Only 2 millicuries of filterable activity was discharged. Table 3 compares the stack releases on a monthly basis.

The release of I^{131} from the main gas disposal systems increased from a monthly average of 4.5 curies in 1963 to 7.0 curies in 1964. The 1964 increase resulted from discharges made in February, March and April. The releases during the other nine months were all below the 1963 average (Figure 4). The filterable activity released in gases averaged 10 millicuries per month in 1964 and 35 millicuries per month in 1963.

TABLE 1
ACTIVITY RELEASED IN LIQUID AND GASEOUS WASTES

Source	Monitoring Station Number ¹	Activity (Curies)			
		Total Sr	Ru ¹⁰⁶	Cs ¹³⁷	Total ²
Liquid Waste to White Oak Creek					
Process waste	1	0.06	< 0.1	≈ 0.07 none	≈ 0.25
Miscellaneous discharges from east end of plant	2	0.01	0.01	detected	0.02
Total discharge from Bethel Valley area	3	0.37	0.03	0.65	1.05
Total discharge from Melton Valley area	4	0.05	< 0.01	0.05	0.10
East waste pit seepage	5	< 0.001	8	none detected	9
West waste pit seepage	6	0.002	6	none detected	7
Total discharge from all sources	3,4,5,6	0.42	14	0.70	17
White Oak Dam to Clinch River (Health Physics measurement)	7	0.59	12.82	0.15	15.46
Gaseous Waste ³					
3039 Stack	8				1.83
3020 Stack	9				0.08
3018 Stack	10				< 0.01
Total activity in gases released					1.91

¹Refers to Fig. 1

²Includes other nuclides not listed here

³Activity primarily I¹³¹ as noted in text

TABLE 2

PROCESS WASTE TREATMENT AND DISCHARGE TO WHITE OAK CREEK

WASTE VOLUME TREATED THIS MONTH: 11.1×10^6 gallonsTOTAL WASTE VOLUME DISCHARGED
TO WHITE OAK CREEK THIS MONTH: 13.3×10^6 gallons

NUCLIDES	PLANT INFLUENT (Curies)	PLANT EFFLUENT AND SETTLING BASIN DIS- CHARGE (Curies)	PERCENT REMOVED BY TREATMENT PLANT & SETTLING BASIN
Total Sr ¹	0.83	0.06	93
Ru ^{103,106}	0.64	≈ 0.07	--
Co ⁶⁰	≈ 0.06	≈ 0.05	--
Cs ¹³⁷	0.13	≈ 0.07	--
Gross Beta Analysis	35 c/m/ml	3 c/m/ml	91

¹Past analyses indicate that "Total Sr" is greater than 90% Sr⁹⁰

TABLE 3

PROCESS WASTE DISCHARGES

SOURCE	GROSS BETA ACTIVITY AVERAGE, c/m/ml	GROSS BETA ACTIVITY ¹ CURIES	VOLUME	
			GAL x 10 ⁶	% OF TOTAL
1. Reactor Operations	40	1.51	2.80	35.1
2. Radioisotope Processing Area	23	0.33	1.06	13.3
3. Buildings 3503 and 3508	16	0.12	0.54	6.8
4. Buildings 3025, 3026 and 3550	26	0.33	0.93	11.7
5. Building 3019	19	0.22	0.85	10.7
6. Fission Products Development Laboratory	12	0.002	0.01	0.1
7. 4500 Area	6	0.072	0.89	11.1
8. Building 3525	21	0.26	0.90	11.2

¹ Approximation - The method of analysis used in determining gross beta activity is not completely sensitive to energies below that of Sr⁹⁰.

TABLE 4

ACTIVITY TRANSFERRED TO PITS AND TRENCHES

Nuclides	Trench No. 5, Curies				Trench No. 7-A, Curies				Trench No. 7-B, Curies			
	This Month	Year 1964	Year 1963	Total to Date	This Month	Year 1964	Year 1963	Total to Date	This Month	Year 1964	Year 1963	Total to Date
Total Sr	502	5805	4851	13974	88	10671	5250	16225	105	6972	6628	13809
Ru ¹⁰⁶	6	124	1096	5973	2	191	1130	1787	2	128	981	1459
Cs ¹³⁷	6510	65198	48108	146485	3070	56468	26296	93052	3684	39560	25947	72975
Co ⁶⁰	9	119	837	1133	2	133	365	529	3	91	385	499
TOTALS	7027	71246	54892	167565	3162	67463	33041	111593	3794	46751	33941	88742

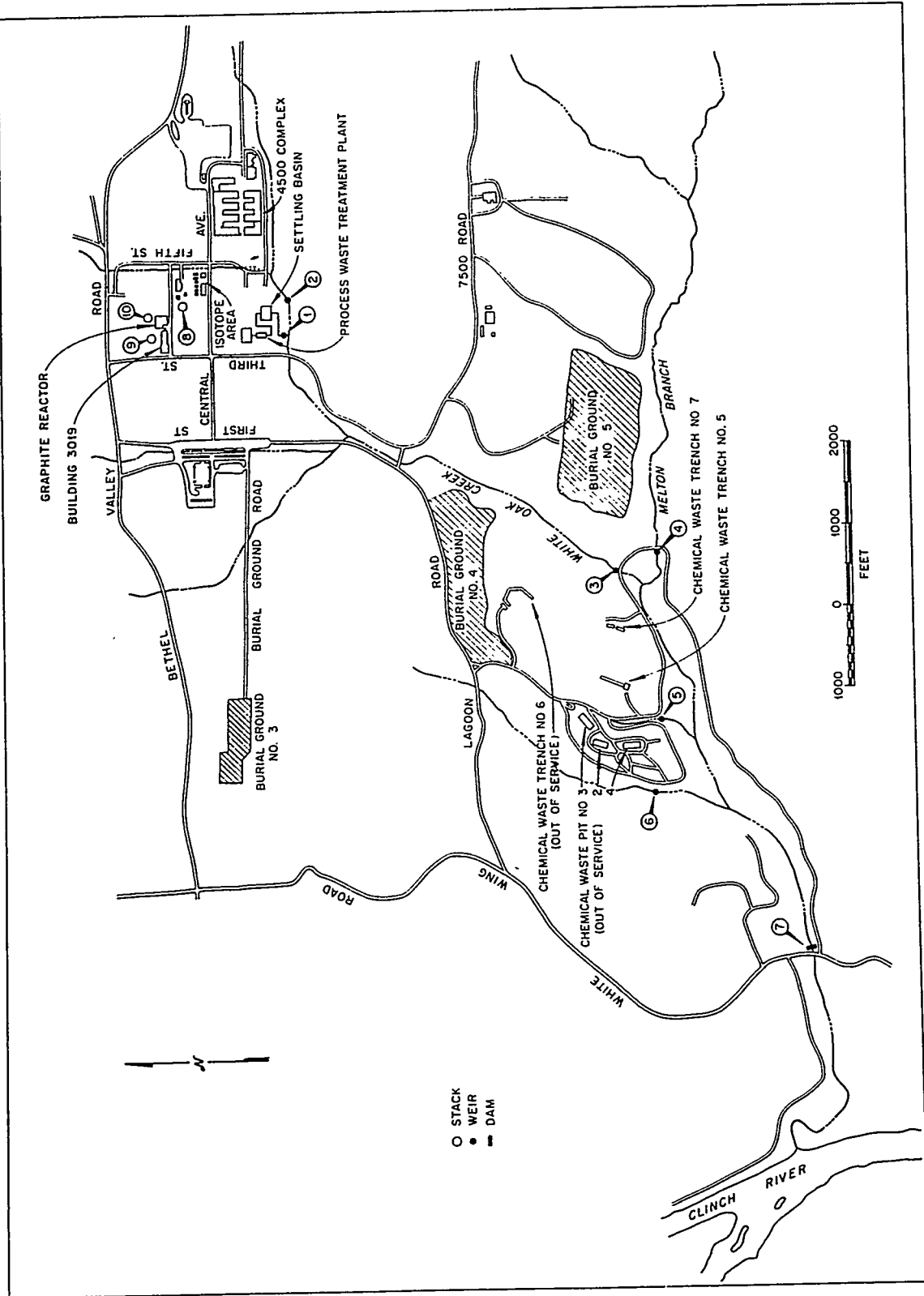


Fig. 1. Location Plan for Laboratory Waste Monitoring Stations

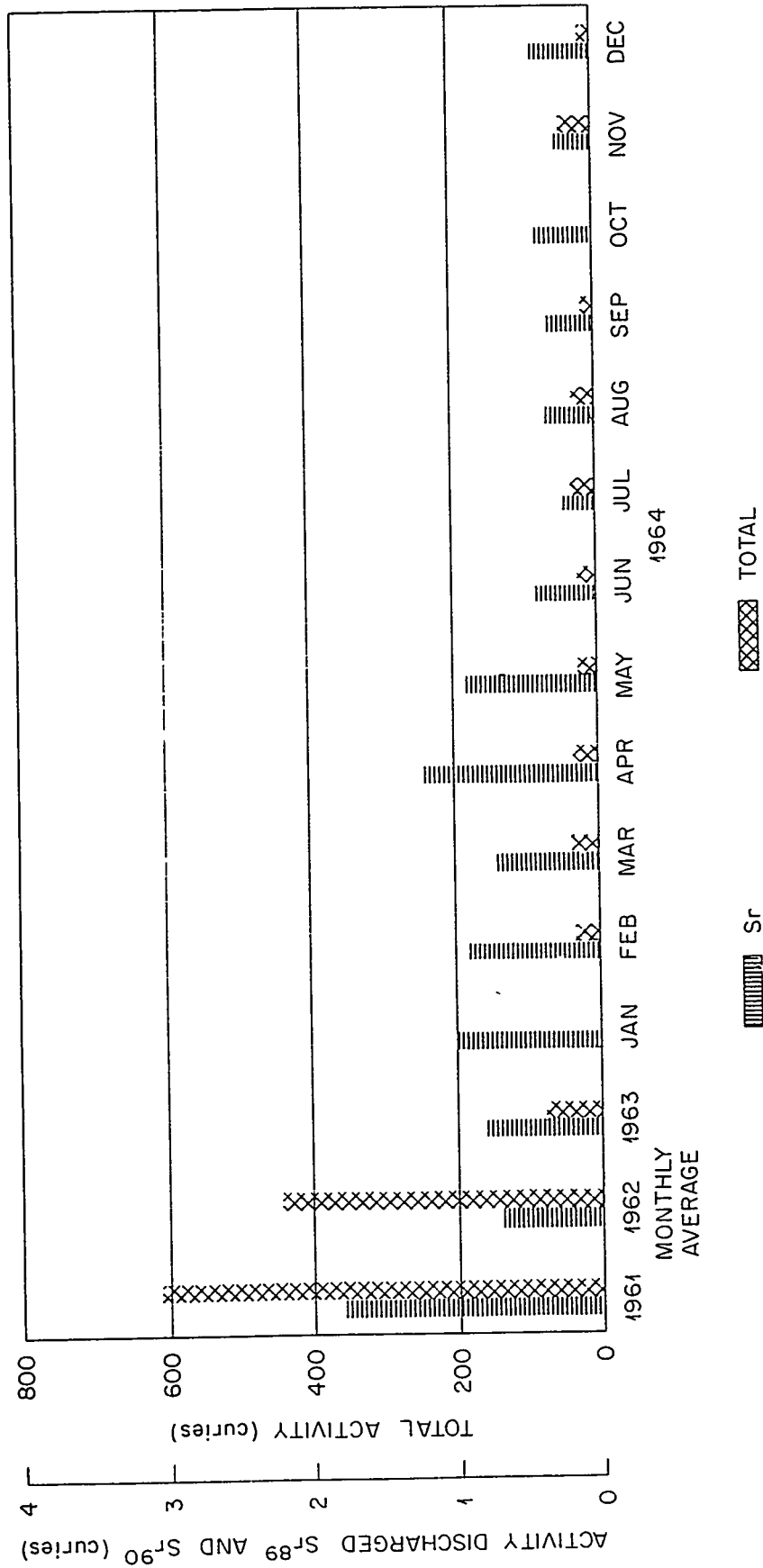


Fig. 2 Activity Discharged in Liquid Waste to White Oak Creek

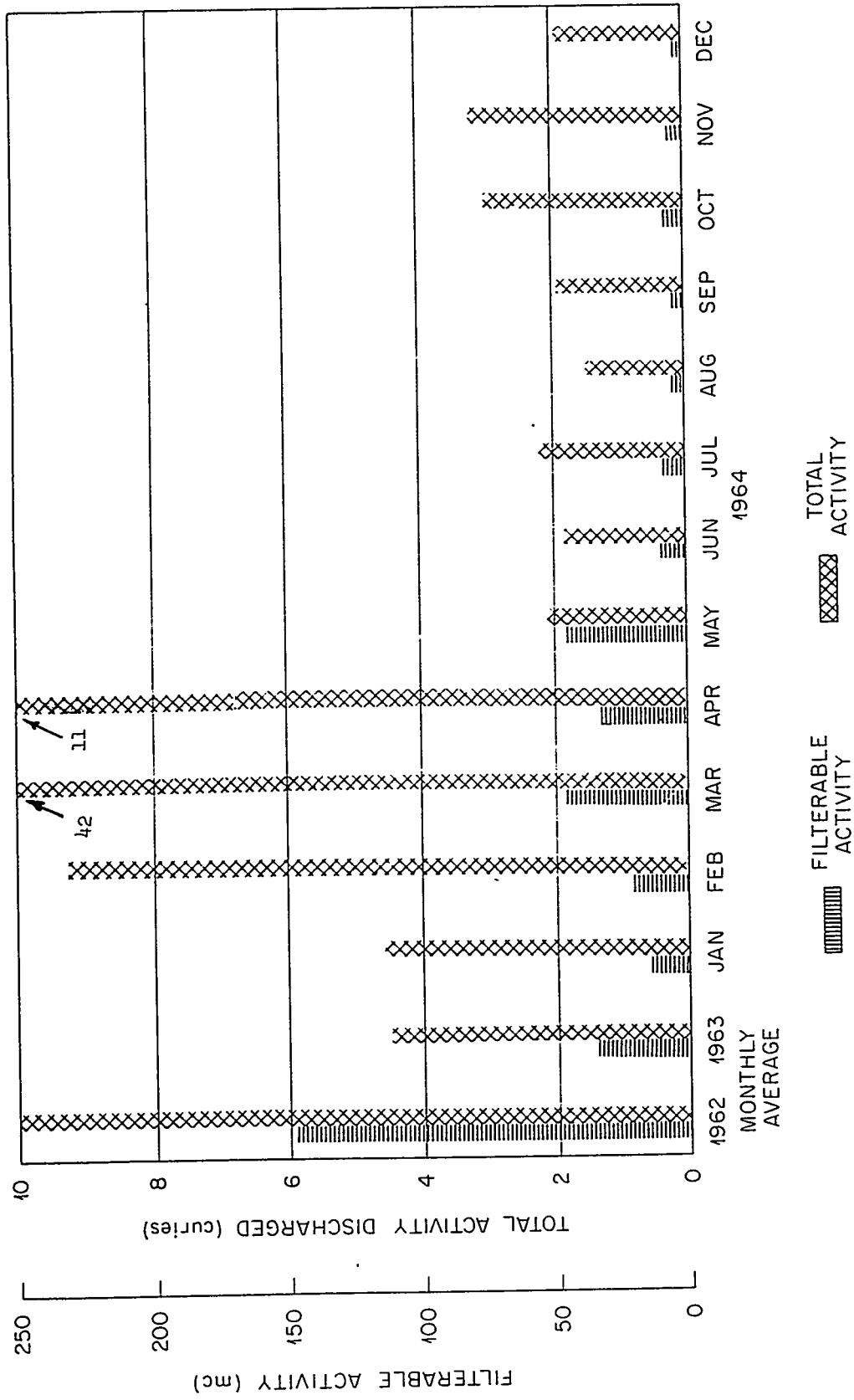


Fig. 3 Activity Release in Gaseous Waste

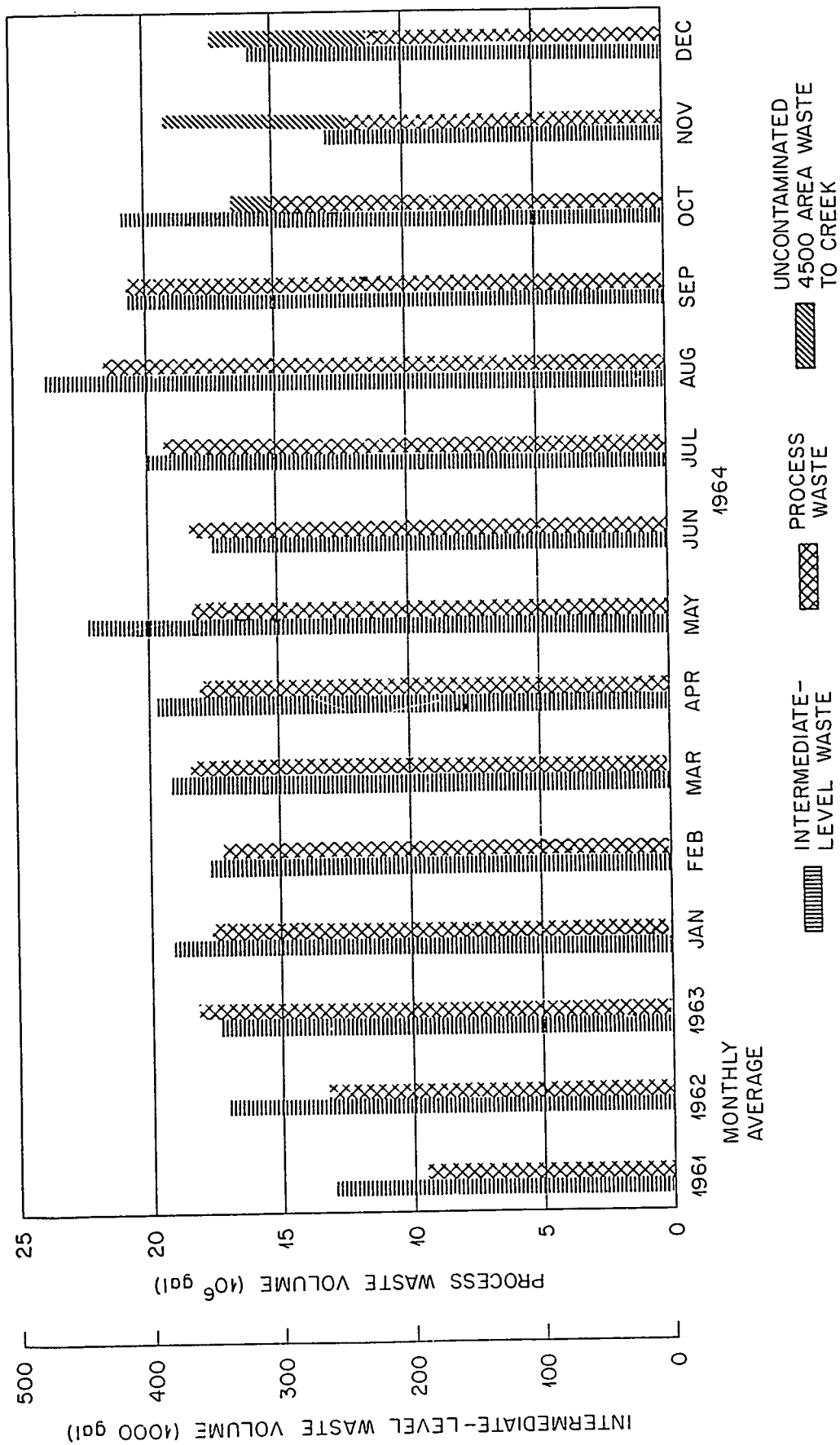
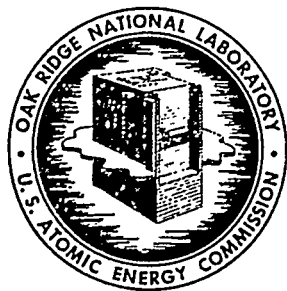


Fig. 4 Liquid Waste Volumes

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Report for the month of November 1966

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LIQUID WASTE

Release to Clinch River

Radioactive contamination of the Clinch River resulting from ORNL waste discharges was 1.92% of the maximum permissible concentration. The main contaminants were strontium and ruthenium, contributing 90.7% and 6.7%, respectively, to the percent of MPC_w . Figure 1 compares the river contamination on a monthly basis. The comparatively high concentrations shown for this month and that for the year-to-date were caused by low river flows. The average flow this month was one-third of normal.

White Oak Creek Monitoring

A total of 3.27 curies was released to White Oak Lake. The activity consisted of 2.0 curies of ruthenium, 0.49 curie of cobalt, 0.46 curie of strontium, and 0.32 curie of cesium.

The ruthenium, cobalt, and approximately 30% of the cesium came from the waste pits and trenches that are no longer used. The discharge from the process waste system accounted for 40% of the total strontium release. Approximately 10% of the strontium came from the Melton Valley area, but the operation responsible for the discharge could not be identified. The remainder of the strontium (50%) was probably scoured from the creek bed which was contaminated by relatively high releases years ago.

A summary of creek monitoring data is given in Table 1. Figures 2 and 3 compare releases of activity into White Oak Lake on a monthly and annual basis.

Process Waste

A total of 11.8 million gallons of low-level waste was chemically

treated at the Waste Treatment Plant. The efficiency of the treatment process was normal; gross analysis indicates that 86% of the beta emitters were removed. A summary of plant operation is shown in Table 2.

Table 3 lists the principal sources of activity discharged into the process waste system. Figure 4 compares the strontium releases from the process waste system to the creek on a monthly basis. The increase in the strontium release this year is due mainly to the intermediate-level waste evaporator operation begun in March. A project is now under way to install an ion-exchange column at the evaporator to reduce the activity in the waste condensate discharged to the process waste system. Figure 5 compares the volumes of process waste handled on a monthly basis.

Intermediate Level Waste

The evaporator operated at an average rate of 385 gph. A table of significant operating data is given below:

	<u>Gallons</u>
Total volume generated	267,000
Volume transferred to evaporator	277,000
Volume of concentrate returned to tank farm	12,000
Volume of concentrate transferred to shale fracturing	40,000
Tank farm free space at beginning of month	323,000
Tank farm free space at end of month	361,000

Main contributors to the ILW system were as follows:

	<u>Gallons</u>
Building 3019	59,000
Fission Products Development Laboratory	59,000

	<u>Gallons</u>
4500 Complex	36,000
Reactor Complex	29,000
Radioisotope Processing Area	13,000

Figure 6 compares the volumes of waste handled on a monthly basis.

Gaseous Waste

A total of 0.89 curie of gaseous radioactivity was discharged from the ORNL stacks. The activity was identified as ^{131}I . The total discharge of particulates was less than 0.01 curie. Figures 7 and 8 compare the gaseous waste releases on a monthly basis.

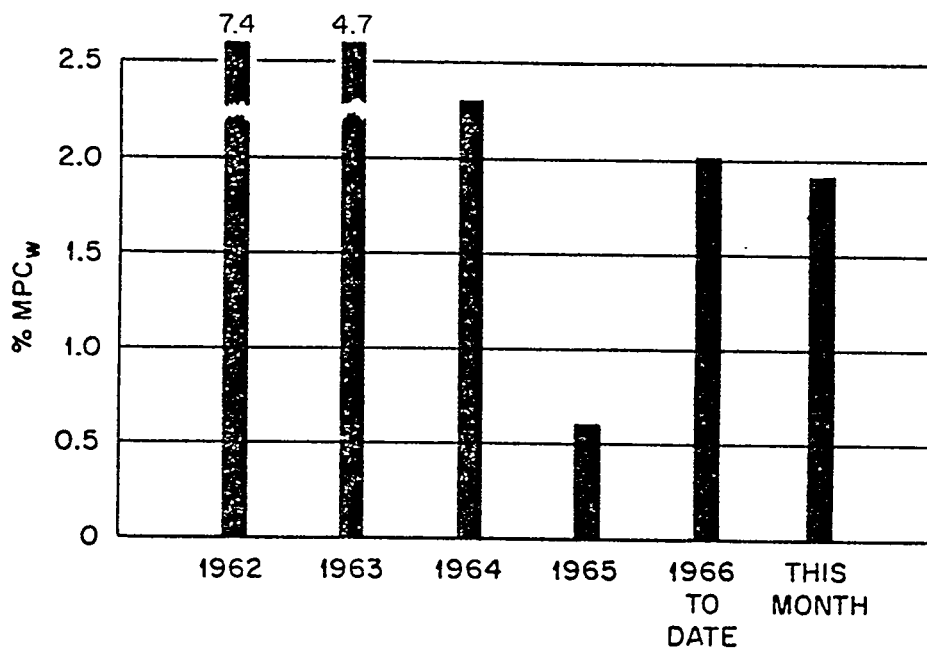


Fig. 1. Calculated Percent of MPC in Clinch River Due to ORNL Discharges (Based on Health Physics Measurements at White Oak Dam)

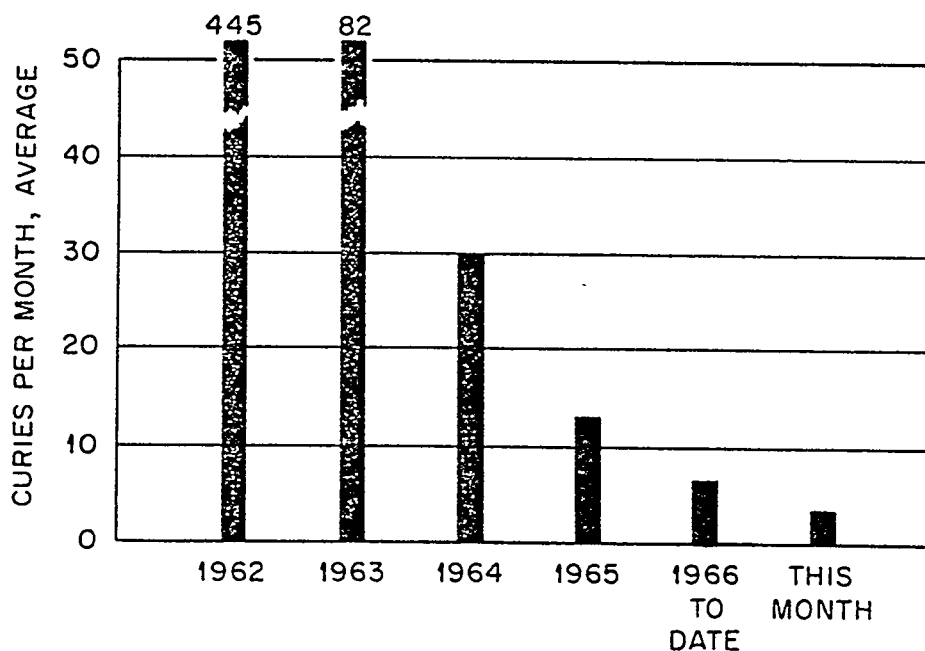


Fig. 2. Total Activity Released to White Oak Lake as Measured at Sampling Stations 3, 4, 5 and 6 (See Fig. 9). The Activity is Mainly ^{106}Ru from the Soil Disposal Area.

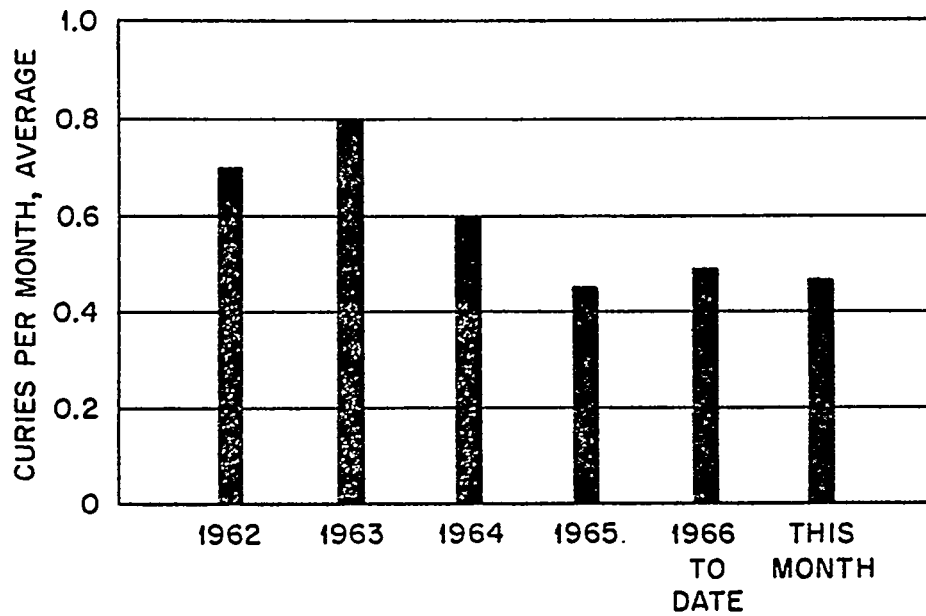


Fig. 3. Total ^{89}Sr and ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3, 4, 5 and 6 (See Fig. 9)

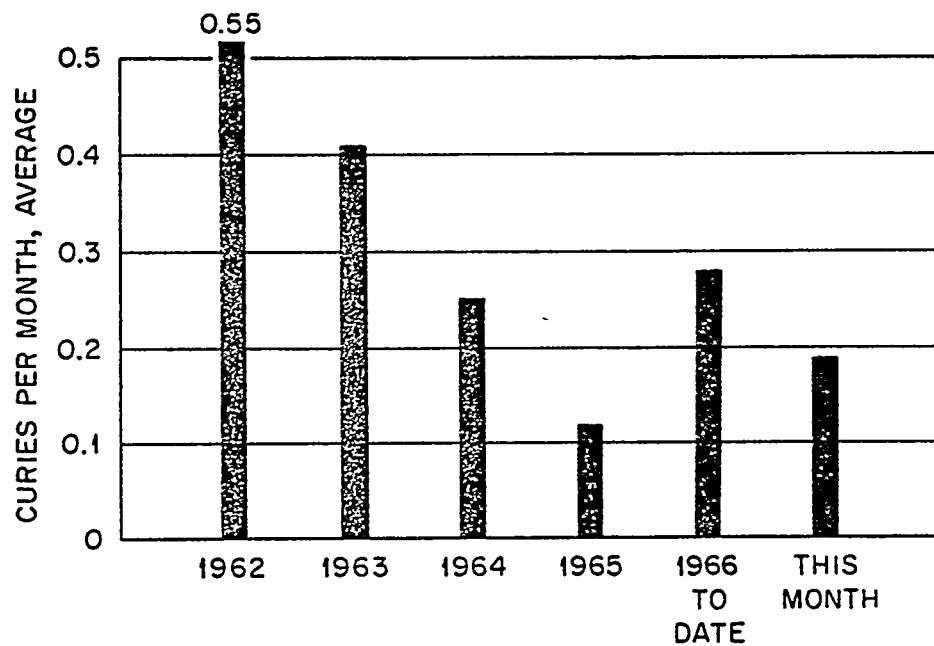


Fig. 4. ^{89}Sr and ^{90}Sr Discharge in Process Waste to White Oak Creek

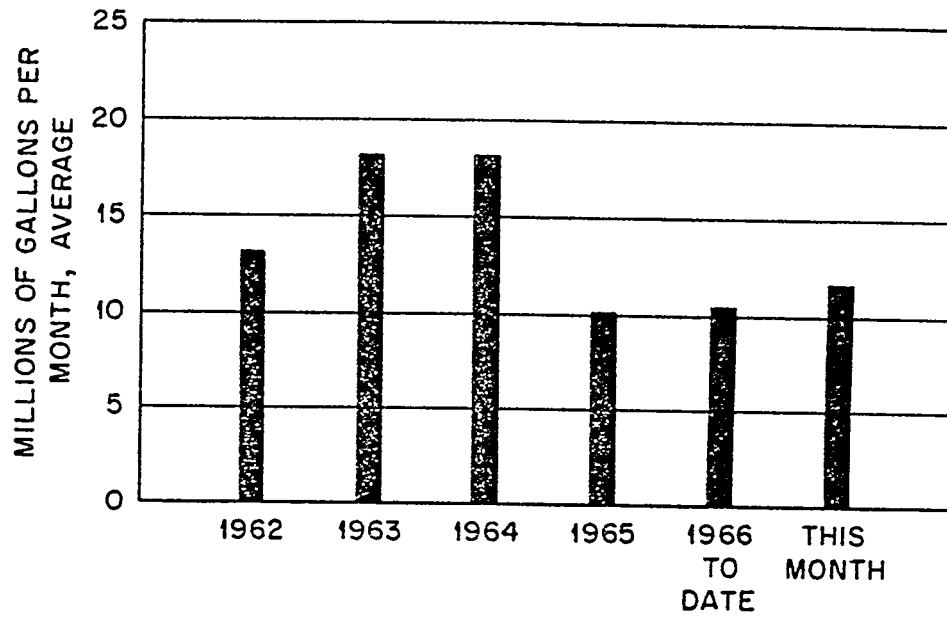


Fig. 5. Process Waste Volumes

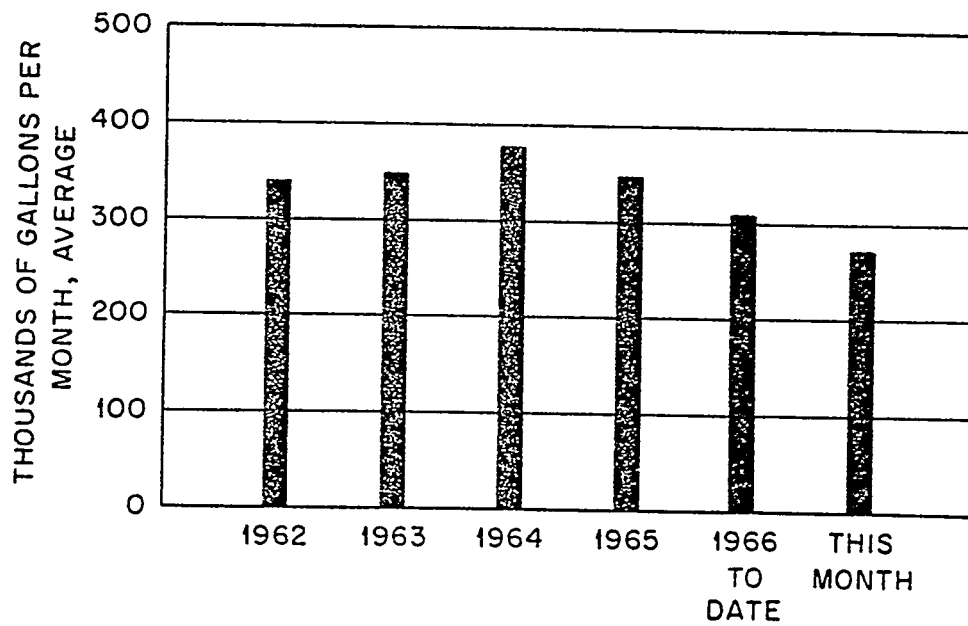


Fig. 6. Intermediate Level Waste Volumes

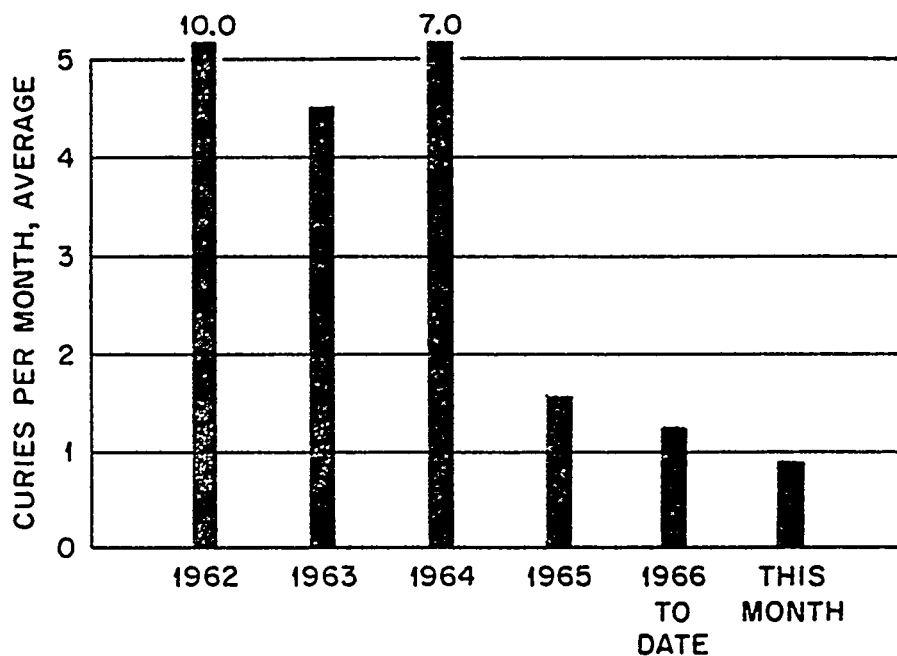


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-adsorbable Species). ORNL's Maximum Permissible Operating Level is 13 curies Per Quarter.

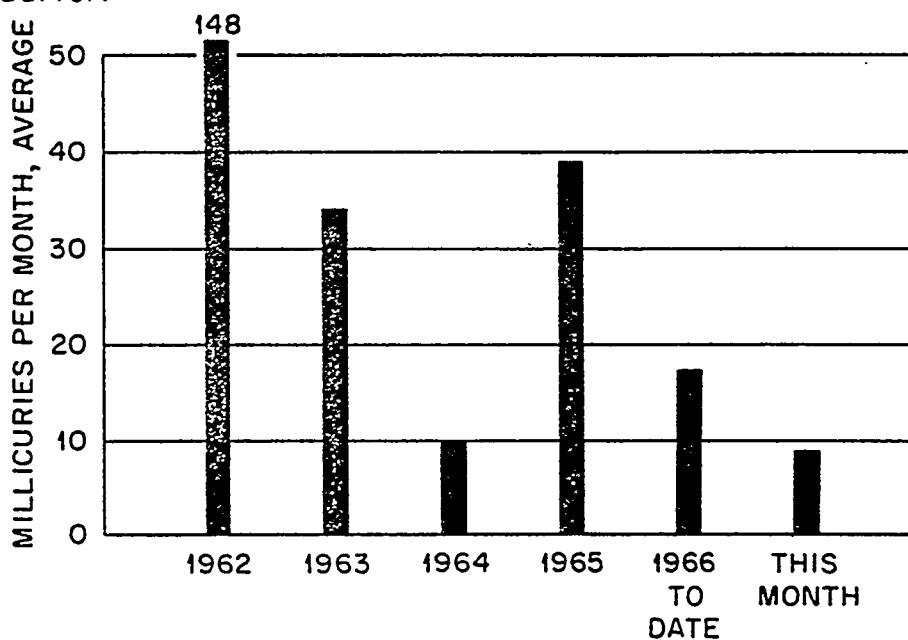


Fig. 8. Filterable Activity Released in Gaseous Waste

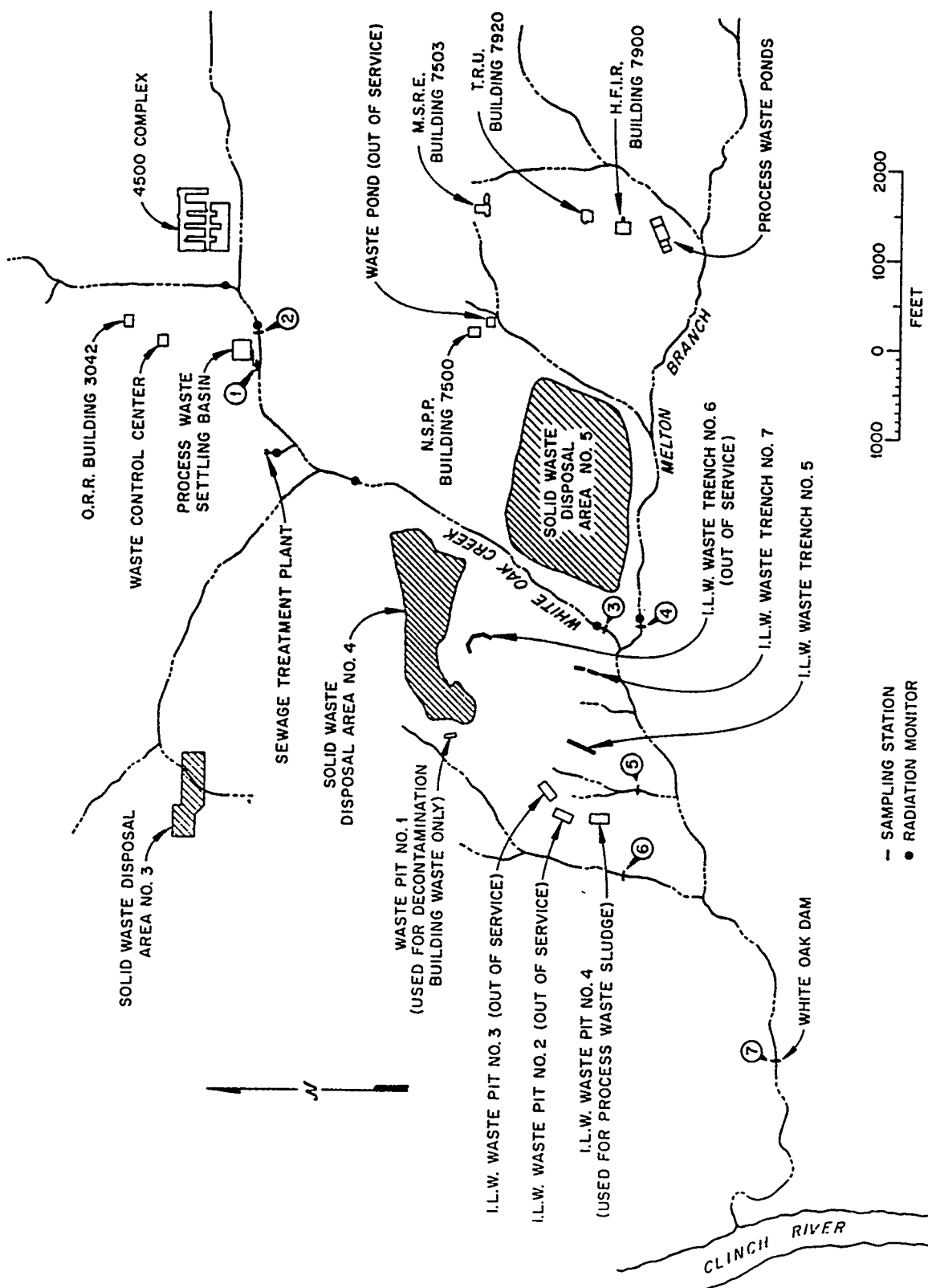


Fig. 9. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

TABLE 1
ACTIVITY RELEASED IN LIQUID WASTES TO WHITE OAK CREEK

Source	Monitoring Station	Number ^a	Activity (Curies)			
			Total Sr	¹⁰⁶ Ru	¹³⁷ Cs	⁶⁰ Co
Process waste		1	0.19	None	0.13	None
Miscellaneous discharges from east end of plant		2	< 0.01	None	< 0.01	None
Total discharge from Bethel Valley Area		3	0.41	0.02	0.21	None
Total discharge from Melton Valley Area		4	0.05	< 0.01	< 0.01	None
East waste pit seepage		5	< 0.01	1.34	0.09	0.47
West waste pit seepage		6	< 0.01	0.64	0.02	0.02
Total discharge from all sources		3,4,5,6	0.46	2.00	0.32	0.49
White Oak Dam to Clinch River (Health Physics measurement)		7	0.44	2.66	0.06	0.33

^aRefers to Fig. 9

^bIncludes other nuclides not listed here

TABLE 2

PROCESS WASTE TREATMENT AND DISCHARGE TO WHITE OAK CREEK

WASTE VOLUME TREATED THIS MONTH: 11.8×10^6 galTOTAL WASTE VOLUME DISCHARGED
TO WHITE OAK CREEK THIS MONTH: 13.7×10^6 gal

NUCLIDES	PLANT INFLUENT (Curies)	PLANT EFFLUENT AND SETTLING BASIN DIS- CHARGE (Curies)	PERCENT REMOVED BY TREATMENT PLANT AND SETTLING BASIN
Total Sr ^a	0.93	0.19	80
^{103,106} Ru	None	None	--
⁶⁰ Co	0.06	None	100
¹³⁷ Cs	0.91	0.13	86
Gross Beta	44 c/m/ml	6 c/m/ml	86

^aPast analyses indicate that "Total Sr" is greater than 90% ⁹⁰Sr.

TABLE 3

PROCESS WASTE DISCHARGES

SOURCE	GROSS BETA ACTIVITY AVERAGE, c/m/ml	GROSS BETA ACTIVITY ^a		VOLUME	
		CURIES	% OF TOTAL	MILLION GALLONS	% OF TOTAL
1. Reactor Operations	17	0.61 ^b	53.5	2.77	23.5
2. Radioisotope Processing Area	7	0.16	14.0	1.85	15.7
3. Buildings 3503 and 3508	4	0.11	9.6	2.11	17.9
4. Buildings 3025 and 3026	3	0.10	8.8	2.50	21.2
5. Building 3019	2	0.08	7.0	0.27	2.3
6. Fission Products Development Laboratory	Not sampled	--	--	0.41	3.5
7. Waste Evaporator, Building 2531	4	0.06	5.3	1.20	10.2
8. Buildings 3525 and 3550	1	0.01	0.9	0.56	4.7
9. Building 2026	4	0.01	0.9	0.12	1.0
10. Melton Valley Area	None	--	--	--	--

^aApproximation - The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

^bThe bulk of this activity is from contaminated ground water which is seeping into the pipe line in the vicinity of Building 3047 in the Radioisotopes Area.

TABLE 4
ACTIVITY RELEASED IN GASEOUS WASTES

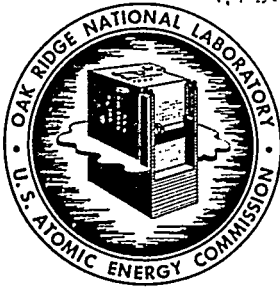
Area	Stack No.	Activity ^a (Curies)
HRLAL	2026	0.04
Central Radioactive Gas Disposal Facilities	3039	0.81
Radiochemical Processing Pilot Plant	3020	0.03
Graphite Reactor Building	3018	< 0.01
MSRE	7512	0.01
HFIR	7911	< 0.01
Total activity in gases released		0.89

^aActivity primarily ¹³¹I as noted in text

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LIQUID WASTE

Release to Clinch River

Radioactive contamination of the river resulting from ORNL waste discharges was 0.67% of the MPC_w for a release to an uncontrolled area. The primary contaminant was strontium, contributing 93% of the measured percent of MPC_w . Figure 1 compares the river contamination on a monthly basis. Data pertaining to the White Oak Dam were provided by the Health Physics Division

White Oak Creek Monitoring

The radioactive waste discharged into White Oak Lake amounted to 2.03 curies. More than one-half of the activity, primarily ruthenium and cobalt, came from the ground disposal areas. Cesium, released primarily from the process waste system, totaled 0.37 curie. The strontium contamination amounted to 0.50 curie; 0.25 curie was released as process waste, 0.16 curie is attributed to the creek drainage system and 0.09 curie came from the Melton Valley environs. There was no significant release of alpha contamination to the creek.

The creek monitoring data are summarized in Table 1. Figures 2 and 3 compare the releases of activity into White Oak Lake on a monthly basis.

Process Waste

Approximately 11 million gallons of process waste were chemically treated this month. A summary of plant operation is shown in Table 2.

Table 3 lists the principal sources of radioactivity discharged into the system. Figure 4 compares the strontium releases on a monthly basis and Figure 5 compares the volume of waste handled.

Intermediate-Level Waste

The evaporator operated at an average rate of 389 gph. A summary of operating data is listed below:

	<u>Gallons</u>
Total volume generated	261,000
Volume transferred to the evaporator	280,000
Volume of concentrate returned to tank farm	20,000
Tank Farm free space at beginning of month	551,000
Tank Farm free space at end of month	550,000

The main contributors to the ILW system were as follows:

	<u>Gallons</u>
1. Reactor Complex	52,000
2. Building 3019	40,000
3. 4500 Complex	31,000
4. Building 3026	26,000
5. Radioisotopes Processing Area	26,000
6. Fission Products Development Laboratory	18,000
7. Building 3525	10,000

Shale Fracturing Disposal of Intermediate-Level
Waste (ILW), Injection 3

A total of 83,000 gallons of concentrated ILW was disposed of by the hydraulic fracturing method. The isotopic content, in amounts greater than 100 curies, of the waste was as follows: cesium, 17,000 curies; strontium, 9,000 curies; cobalt, 200 curies; and ruthenium, 400 curies. The waste was injected at a depth of 862 feet - the same slot also used for disposal of 163,000 gallons of ILW in injections 2a and 2b. The slot was closed off with a cement plug at the termination

of injection 3. The material used in the injection and other pertinent data are as follows:

<u>Liquids</u>		<u>Gallons</u>
Concentrated waste		83,000
Water for start-up and wash-down		4,000
Water for disposal of excess solids		12,000
Tributyl phosphate		<u>50</u>
Total volume of liquid injected		99,050
<u>Solids</u>	<u>Weight, lb.</u>	<u>lb/gal</u>
Portland cement, type 2	200,000	2.02
Fly ash	200,000	2.02
Attapulgate	95,000	0.96
Grundite	<u>50,000</u>	<u>0.50</u>
Total weight of solids	545,000	5.50

Gaseous Waste

The ORNL stack systems discharged 1.61 curies of activity. This activity was primarily ^{131}I , and most of it was released from the 3039 stack. The amount of activity associated with particulates was negligible; 12 millicuries (cesium) were detected. There was no significant release of alpha activity.

The stack releases are given in Table 4. Figures 7 and 8 compare discharges on a monthly basis.

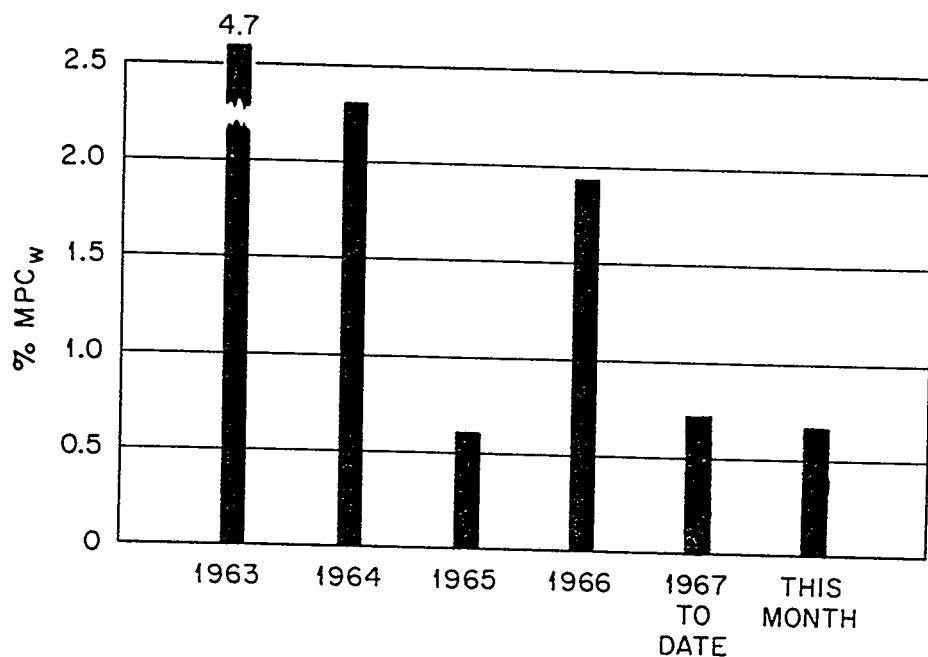


Fig. 1. Calculated Percent of MPC in Clinch River Due to ORNL Discharges.
(Health Physics Measurements at White Oak Dam)

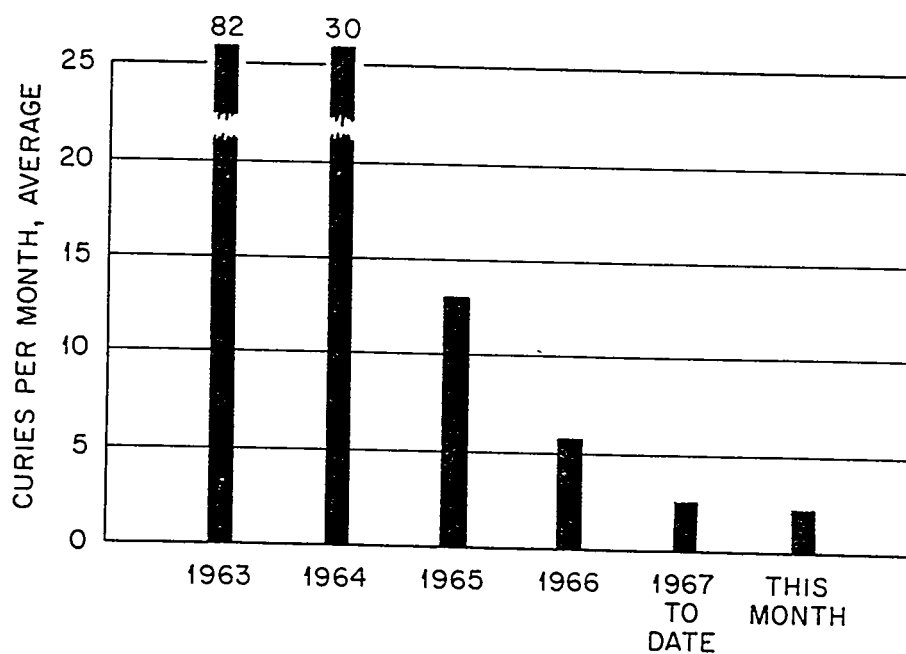


Fig. 2. Total Activity Released to White Oak Lake as Measured at
Sampling Stations 3, 4, 5 and 6 (See Fig. 9).

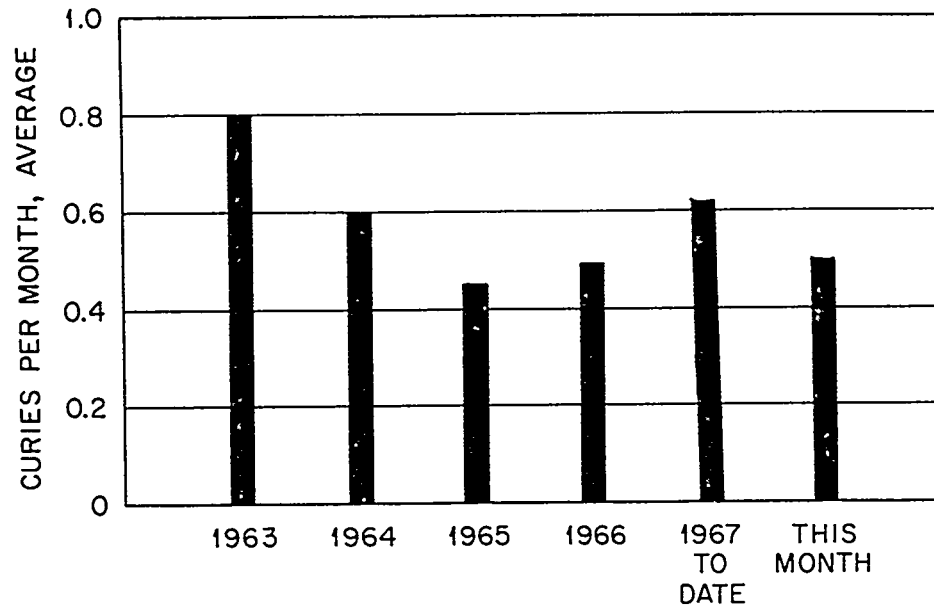


Fig. 3. Total ^{89}Sr and ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3, 4, 5, and 6. (See Fig. 9)

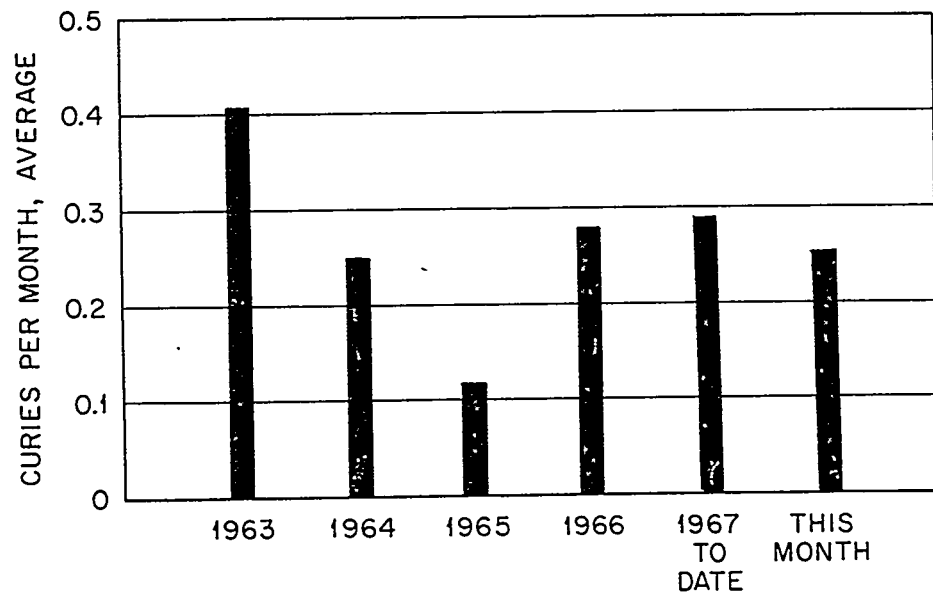


Fig. 4. ^{89}Sr and ^{90}Sr Discharge in Process Waste to White Oak Creek.

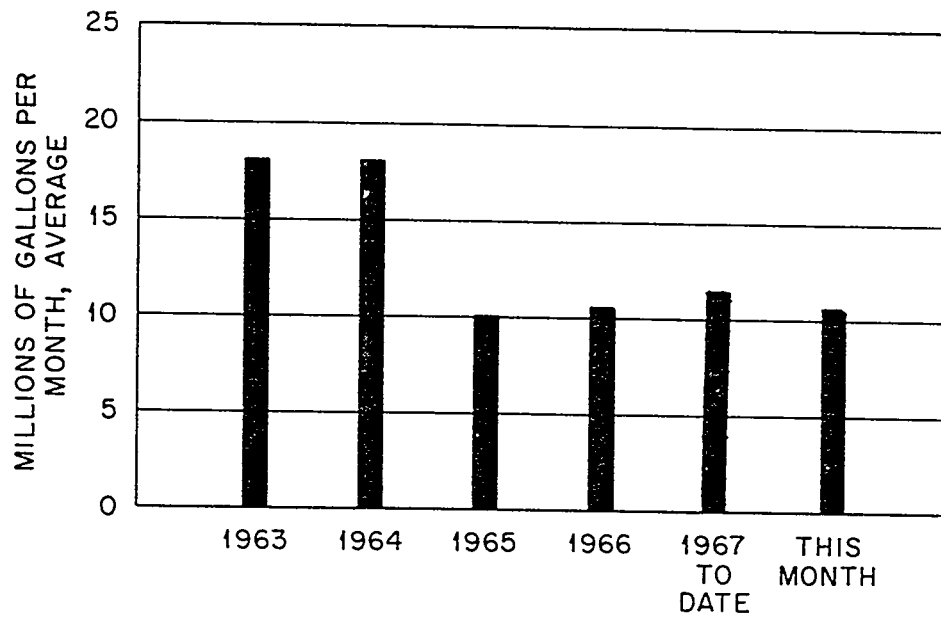


Fig. 5. Process Waste Volumes.

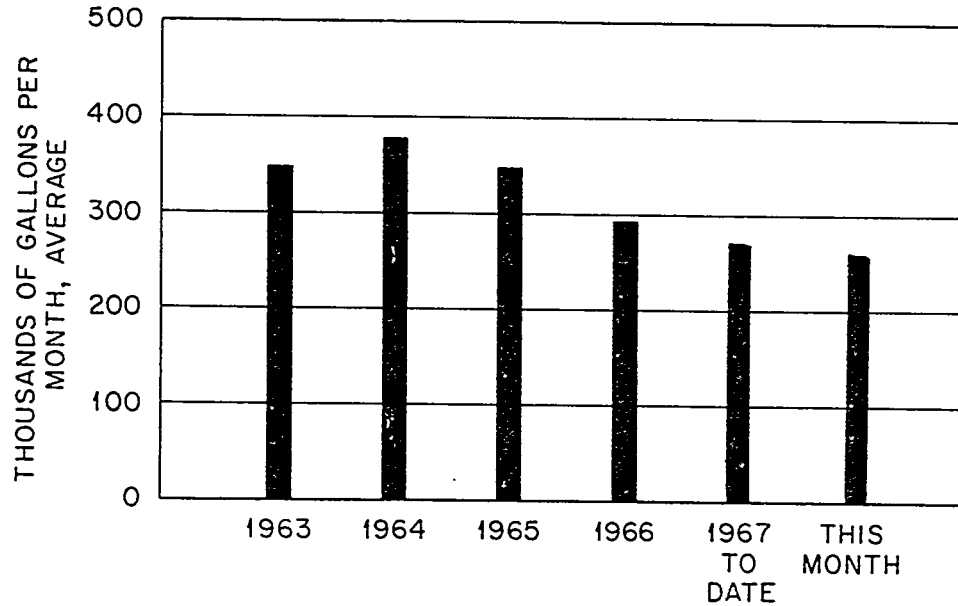


Fig. 6. Intermediate-Level Waste Volumes.

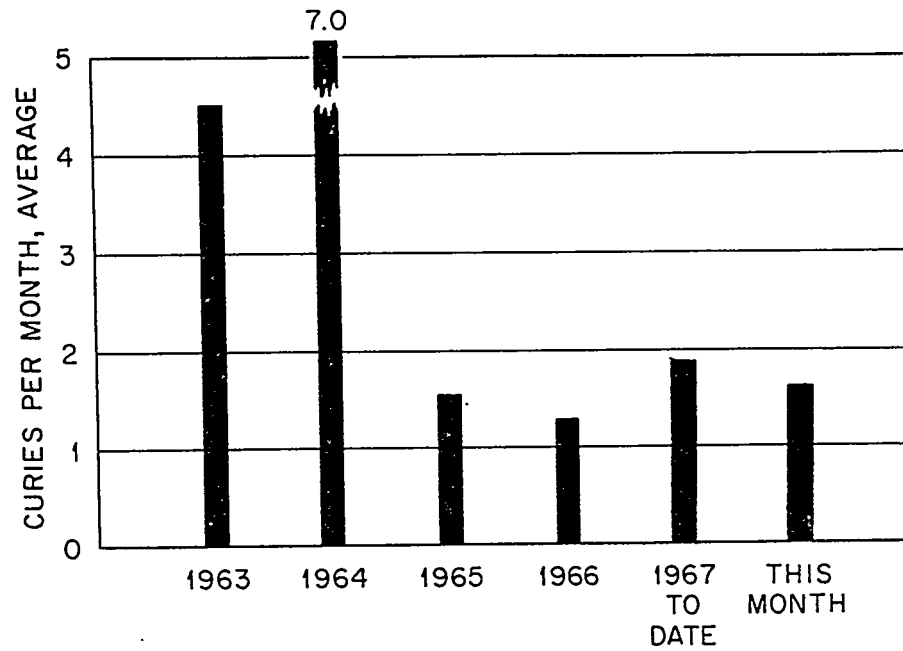


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-adsorbable Species). ORNL's Maximum Permissible Operating Level is 13 curies Per Quarter.

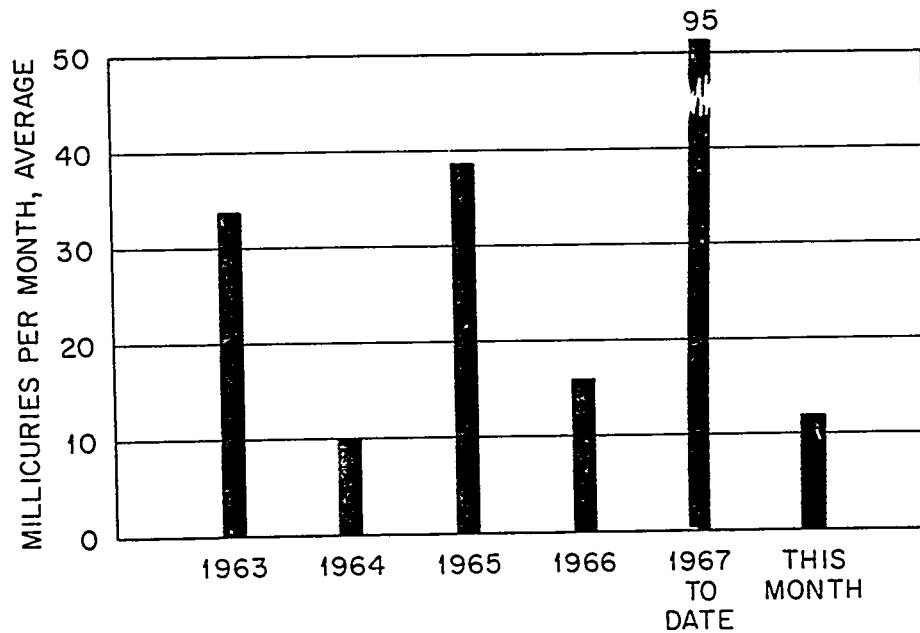


Fig. 8. Filterable Activity Released in Gaseous Waste.

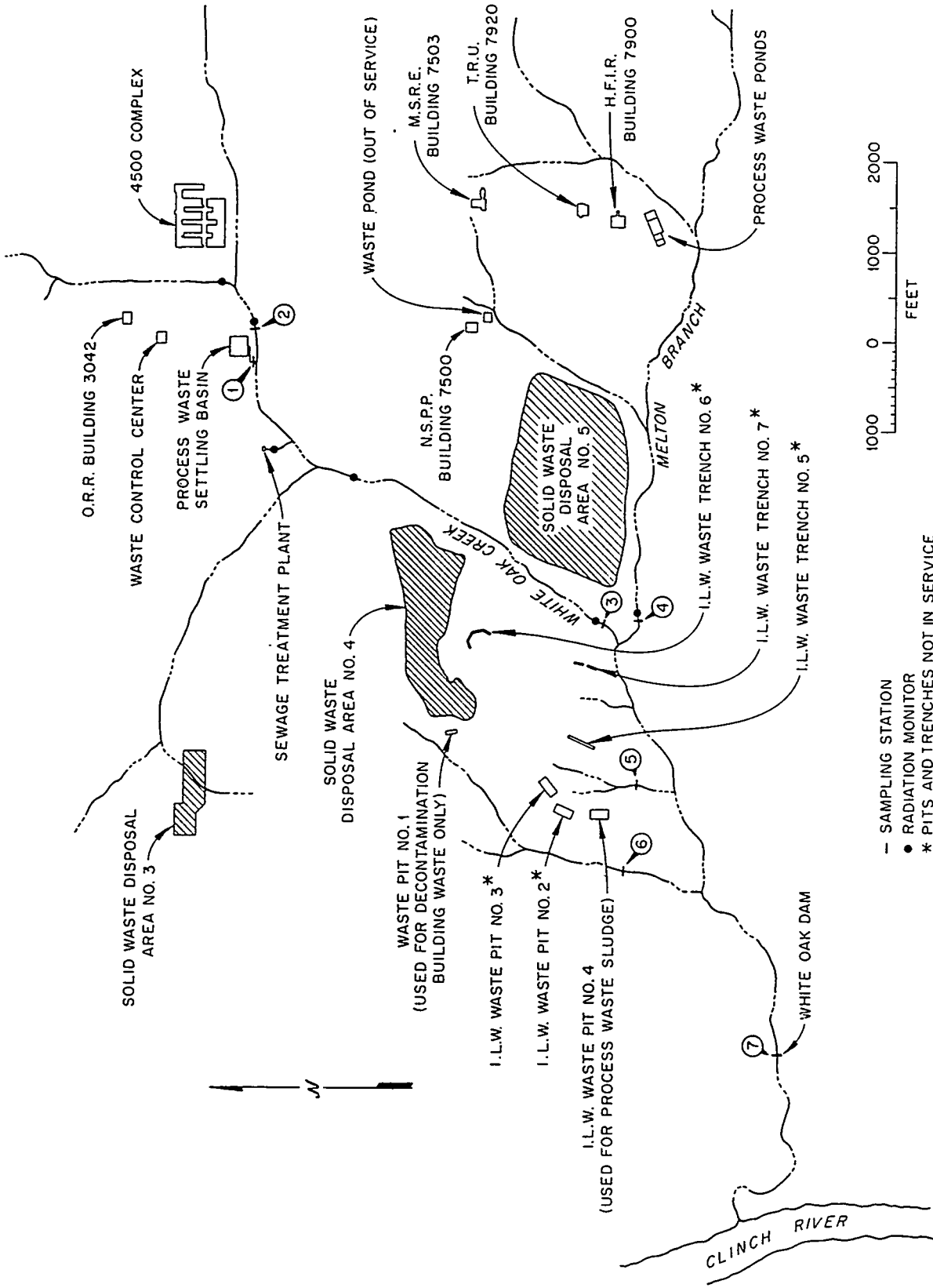


Fig. 9. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

TABLE 1
ACTIVITY RELEASED IN LIQUID WASTES TO WHITE OAK CREEK

Source	Monitoring Station Number ^a	Activity (Curies)			
		Total Sr	¹⁰⁶ Ru	¹³⁷ Cs	⁶⁰ Co
Process waste	1	0.25	0.06	0.50	0.01
Miscellaneous discharges from east end of plant	2	< 0.01	0.03	0.01	0.03
Total discharge from Bethel Valley Area	3	0.41	0.01	0.33	none detected
Total discharge from Melton Valley Area	4	0.09	< 0.01	< 0.01	none detected
East waste pit seepage	5	< 0.01	0.48	0.02	0.33
West waste pit seepage	6	< 0.01	0.25	0.02	0.09
Total discharge from all sources	3,4,5,6	0.50	0.74	0.37	0.42
White Oak Dam to Clinch River (Health Physics measurement)	7	0.66	0.41	0.32	0.26
					2.84 ^b

^aRefers to Figure 9.

^bIncludes other nuclides not listed here.

TABLE 2

PROCESS WASTE TREATMENT AND DISCHARGE TO WHITE OAK CREEK

WASTE VOLUME TREATED THIS MONTH: 10.9×10^6 galTOTAL WASTE VOLUME DISCHARGED
TO WHITE OAK CREEK THIS MONTH: 12.3×10^6 gal

NUCLIDES	PLANT INFLUENT (Curies)	PLANT EFFLUENT AND SETTLING BASIN DIS- CHARGE (Curies)	PERCENT REMOVED BY TREATMENT PLANT AND SETTLING BASIN
Total Sr ^a	1.11	0.25	78
^{103,106} Ru	0.06	0.06	0
⁶⁰ Co	None detected	0.01	-
¹³⁷ Cs	2.26	0.50	78
Gross Beta Analysis	67 c/m/ml	13 c/m/ml	81

^aPast analyses indicate that "Total Sr" is greater than 90% ⁹⁰Sr.

TABLE 3

PROCESS WASTE DISCHARGES

SOURCE	GROSS BETA ACTIVITY AVERAGE, c/m/ml	GROSS BETA ACTIVITY ^a CURIES	% OF TOTAL	VOLUME	
				MILLION GALLONS	% OF TOTAL
1. Reactor Operations	15 ^b	0.59 ^b	51.3	2.81	25.9
2. Radioisotope Processing Area	9	0.17	14.8	1.35	12.4
3. Buildings 3503 and 3508	2	0.03	2.6	1.22	11.2
4. Buildings 3025 and 3026	1	0.03	2.6	2.09	19.2
5. Building 3019	1	0.01	0.9	0.40	3.7
6. Fission Products Development Laboratory	8	0.01	0.9	0.05	0.5
7. Waste Evaporator, Building 2531	17	0.29	25.2	1.22	11.2
8. Buildings 3525 and 3550	1	0.02	1.7	1.72	15.8
9. Building 2026	2	< 0.01	--	0.01	0.1
10. Melton Valley Area	No waste processed		--	--	--

^aApproximation - The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

^bThe bulk of this activity is from contaminated ground water which is seeping into the pipe line in the vicinity of Building 3047 in the Radioisotopes Area.

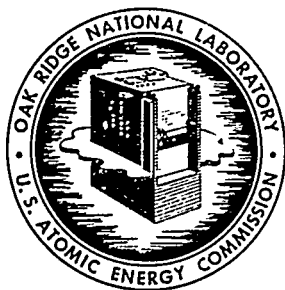
TABLE 4
ACTIVITY RELEASED IN GASEOUS WASTES

Area	Stack No.	Activity ^a (Curies)
HRLAL	2026	0.25
Central Radioactive Gas Disposal Facilities	3039	1.35
Radiochemical Processing Pilot Plant	3020	0.01
Graphite Reactor Building	3018	< 0.01
MSRE	7512	< 0.01
HFIR	7911	< 0.01
Total activity in gases released		1.61

^aActivity primarily ¹³¹I as noted in text

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Report for the month of October, 1968

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LIQUID WASTE

Release to Clinch River

Radioactive contamination of the river caused by ORNL waste discharges was 0.33% of the MPC_w for a release to an uncontrolled area (see Figure 1). The main contaminant was strontium which contributed 96% of the calculated percent of MPC_w .

White Oak Creek Monitoring

A total of 0.48 curies of strontium, 0.15 curies of cesium, and 0.05 curies of ruthenium was released to White Oak Lake (see Table 1). The 0.22-curie difference in the strontium measured at Station 3 and that measured in the process waste effluent at Station 1 may, in part, be explained by possible erratic sampling or analysis. The Waste Treatment Plant efficiency normally varies between 80% and 85%; whereas, the analytical data in Table 2 shows the plant to be 95% efficient. Another possible explanation for the difference between the measurements made at Stations 1 and 3 is the leaching of activity from Burial Ground 4. The only apparent source of the activity (0.22 curies) measured in the Melton Valley branch at Station 4 is Burial Ground 5. There was no significant release of alpha activity.

A comparison of this month's strontium releases to those of previous months is shown in Figures 2 and 3.

Process Waste

A total of 12 million gal of waste was treated this month. A summary of plant operations is given in Table 2. Table 3 lists the individual waste releases into the system; Figure 4 shows a monthly comparison of the volumes of waste handled.

Intermediate-Level Waste

The evaporator operated at an average boil-down rate of 265 gph. A summary of operation is listed below:

	<u>Gallons</u>
Total volume generated	200,000
Volume transferred to evaporator	199,000
Volume of concentrate returned to Tank Farm	12,000
Volume of concentrate transferred to shale fracturing site	11,000
Tank Farm free space at beginning of month	576,000
Tank Farm free space at end of month	574,000

The main contributors to the ILW system were as follows:

	<u>Gallons</u>
1. High Flux Isotope Reactor	56,000
2. Fission Product Development Laboratory	29,000
3. ORR, LITR, and BSR	28,000
4. 4500 Complex	24,000
5. Building 3019	22,000
6. Radioisotope Processing Area	13,000
7. Transuranium Processing Plant	12,000

A monthly comparison of the volumes of ILW generated is shown in Figure 5.

Shale Fracturing Disposal of ILW Injection 5

A total of 81,800 gal of concentrated ILW was injected into a new fracture at a depth of 842 ft. The waste contained 500 curies of strontium, 69,400 curies of cesium, 300 curies of ruthenium, and 100 curies of cobalt. The slot was overdisplaced with water at the termination of the injection. Materials used in the injection are tabulated below. The mixtures are listed in the order of their injection.

<u>Solids</u>	<u>Weight, lb</u>	<u>lb/gal</u>
Portland cement, type 2	188,390	2.2
Kingston fly ash	176,580	2.0
Attapulgate	76,200	0.9
Grundite	<u>46,800</u>	<u>0.5</u>
Total weight of solids	487,970	5.6

<u>Liquids</u>	<u>Gallons</u>
Water only	1,140
Water with solids	490
ILW with solids	81,800
Water with solids	2,850
Water only	<u>830</u>
Total volume injected	87,110

Gaseous Waste

The ORNL stacks discharged a total of 0.21 curies of ^{131}I during the period. There was no significant amount of filterable activity detected. The individual stack releases are tabulated in Table 4; Figure 6 compares the stack releases on a monthly basis.

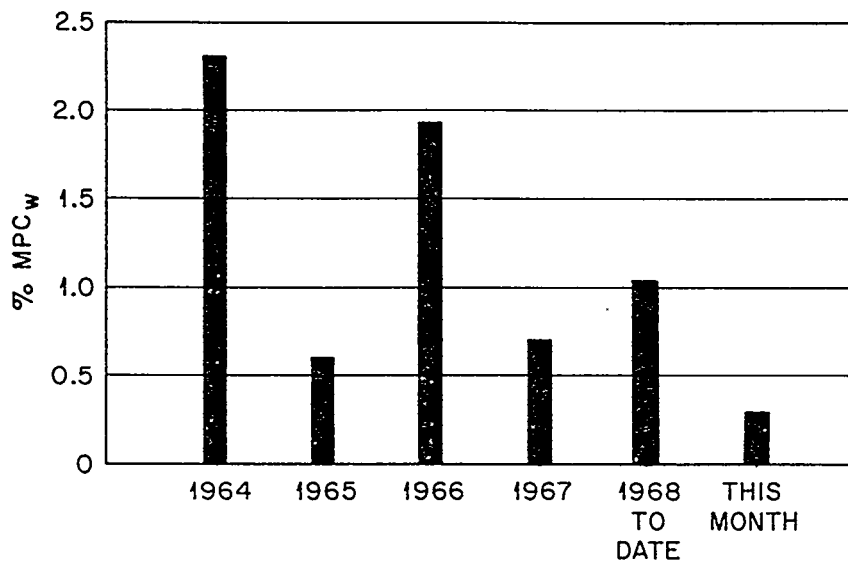


Fig.1. Calculated Percent of MPC in Clinch River Due to ORNL Discharges.
(Health Physics Measurements at White Oak Dam)

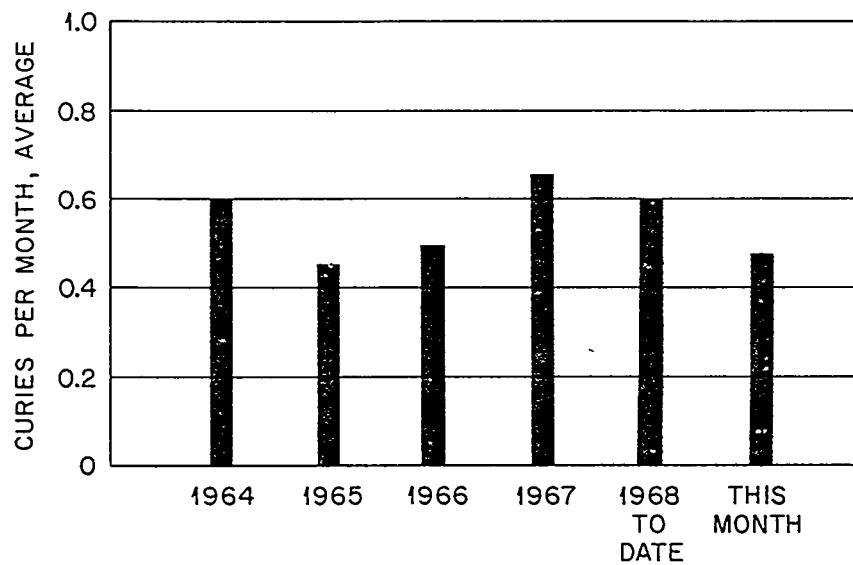


Fig.2. Total ^{89}Sr and ^{90}Sr Released to White Oak Lake as
Measured at Sampling Stations 3 and 4 (See Fig.7)

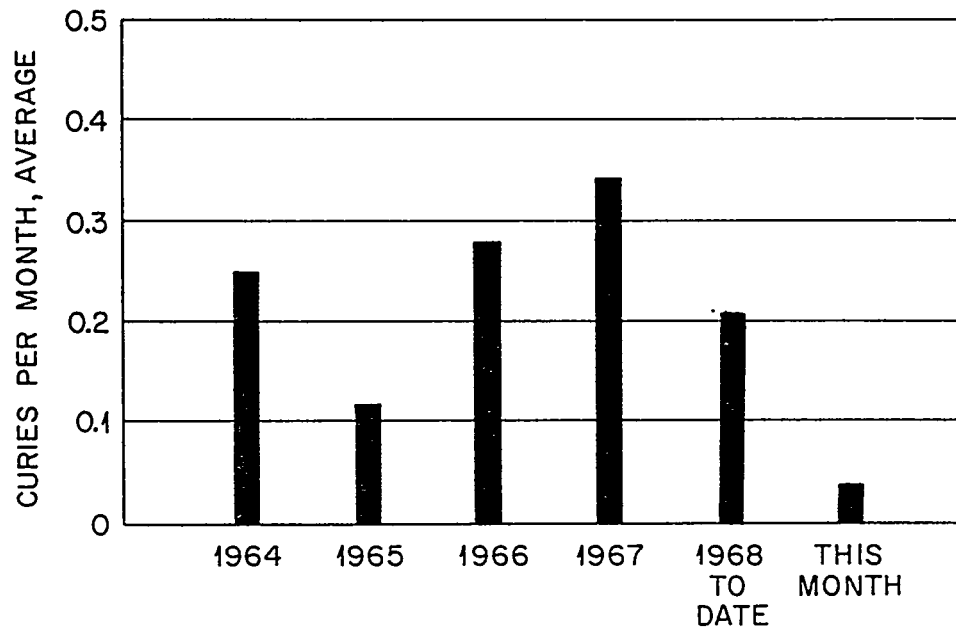


Fig. 3. ^{89}Sr and ^{90}Sr Discharge in Process Waste to White Oak Creek.

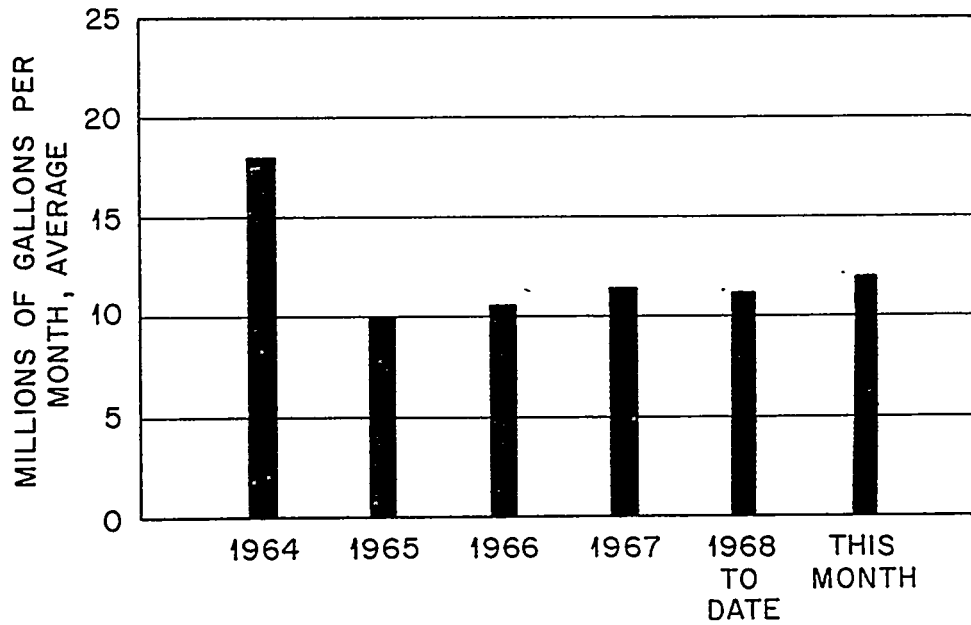


Fig. 4. Process Waste Volumes.

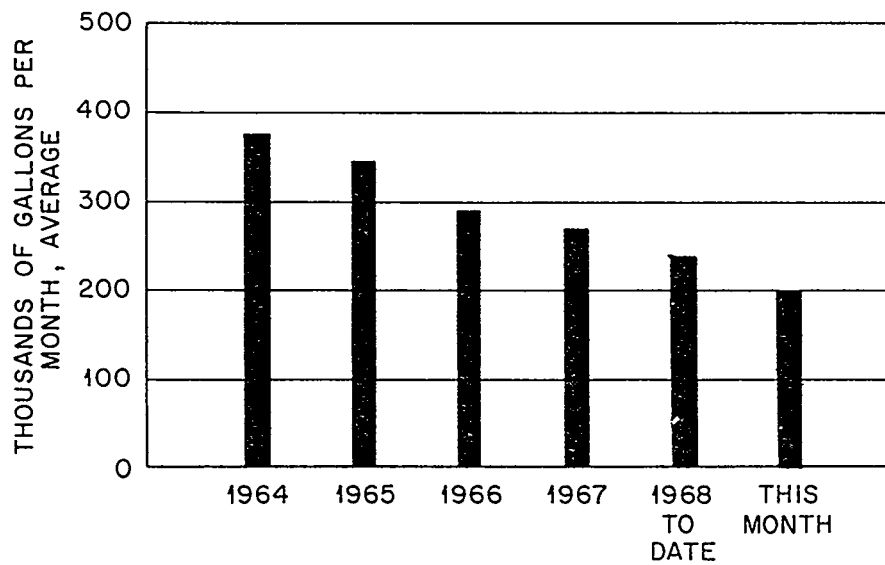


Fig.5. Intermediate-Level Waste Volumes.

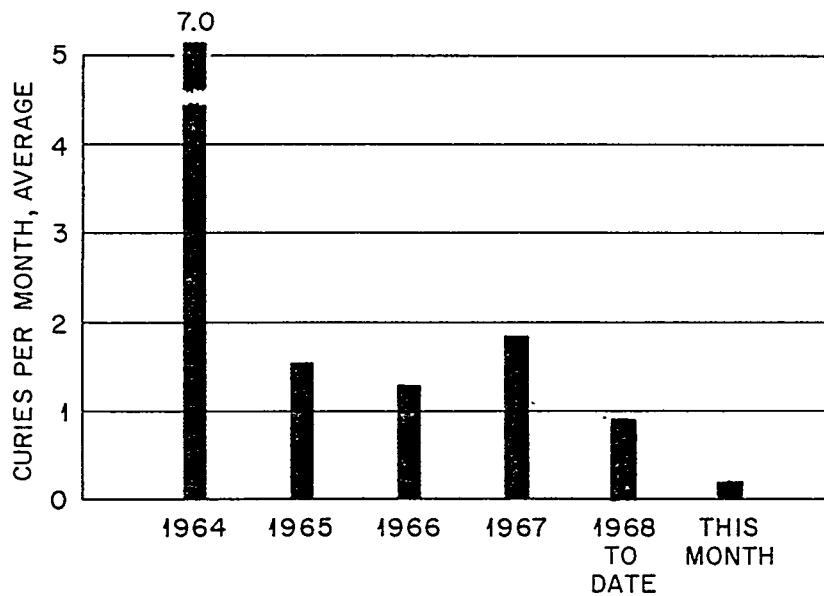


Fig.6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-adsorbable Species). ORNL's Maximum Permissible Operating Level is 13 curies Per Quarter.

ORNL-DWG 65-12157R2

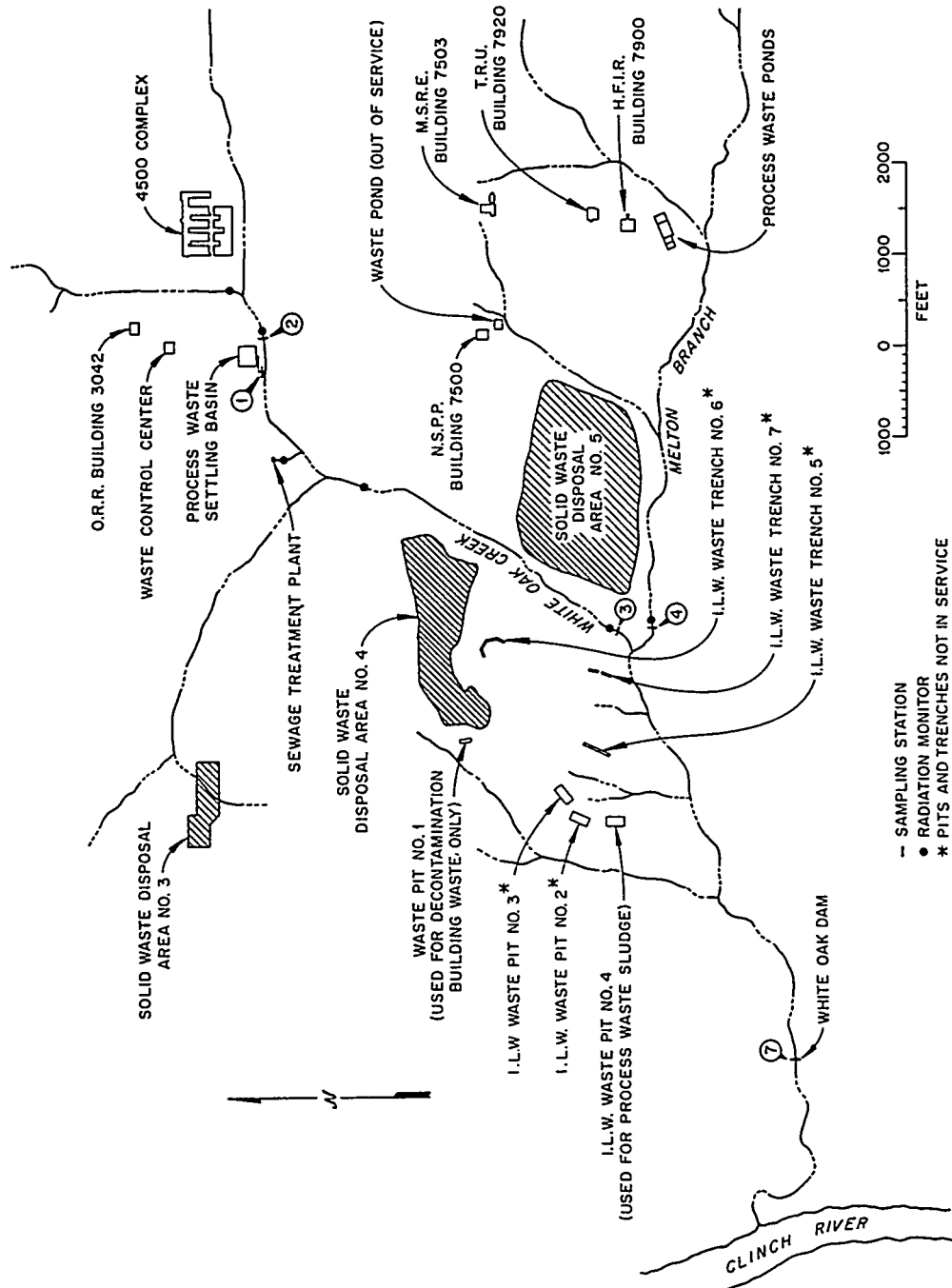


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

TABLE 1
ACTIVITY RELEASED IN LIQUID WASTES TO WHITE OAK CREEK

Source	Monitoring Station	Number ^a	Activity (curies)			
			Total Sr	¹⁰⁶ Ru	¹³⁷ Cs	⁶⁰ Co
Process waste		1	0.04	0.04	0.05	none detected
Miscellaneous discharges from east end of plant		2	< 0.01	< 0.01	none detected	none detected
Total discharge from Bethel Valley Area		3	0.26	0.03	0.15	none detected
Total discharge from Melton Valley Area		4	0.22	0.02	< 0.01	none detected
Total Discharge		3,4	0.48	0.05	0.15	-
White Oak Dam to Clinch River (Health Physics measurement)		7	0.13	0.24	0.06	0.02

^aRefers to Figure 7

TABLE 2

PROCESS WASTE TREATMENT AND DISCHARGE TO WHITE OAK CREEK

WASTE VOLUME TREATED THIS MONTH: 12 x 10⁶ galTOTAL WASTE VOLUME DISCHARGED TO
WHITE OAK CREEK THIS MONTH: 15 x 10⁶ gal

NUCLIDES	PLANT INFLUENT (curies)	PLANT EFFLUENT AND SETTLING BASIN DIS- CHARGE (curies)	PERCENT REMOVED BY TREATMENT PLANT AND SETTLING BASIN
Total Sr ^a	0.78	0.04	95
103, 106Ru	0.08	0.04	50
60Co	0.04	none detected	100
137Cs	0.37	0.05	87
Gross Beta Analysis	39 c/m/ml	1 c/m/ml	97

^aPast analyses indicate that "Total Sr" is greater than 90% ⁹⁰Sr.

TABLE 3

PROCESS WASTE DISCHARGES

	GROSS BETA ACTIVITY AVERAGE, c/m/ml	GROSS BETA ACTIVITY ^a Curies	% OF TOTAL	VOLUME	
				MILLION GALLONS	% OF TOTAL
1. Reactor Operations	14	0.48 ^b	51.6	2.42	23.2
2. Radioisotope Processing Area	5	0.11	11.8	1.64	15.8
3. Buildings 3503 and 3508	7	0.15	16.1	1.50	14.4
4. Buildings 3025 and 3026	0	-	-	2.28	22.0
5. Building 3019	0	-	-	0.89	8.6
6. Fission Products Development, Laboratory	17	0.05	5.4	0.16	1.5
7. Waste Evaporator, Building 2531	10	0.14	15.1	0.96	9.2
8. Buildings 3525 and 3550	0	-	-	0.48	4.6
9. Building 2026	0	-	-	0.06	0.6

^aApproximation - The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

^bThe bulk of this activity is from contaminated ground water which is seeping into the pipe line in the vicinity of Building 3047 in the Radioisotopes Area.

TABLE 4
ACTIVITY RELEASED IN GASEOUS WASTES

Area	Stack No.	Activity ^a (curies)
HRLAL	2026	< 0.01
Central Radioactive Gas Disposal Facilities	3039	0.21
Radiochemical Processing Pilot Plant	3020	< 0.01
MSRE	7512	< 0.01
HFIR	7911	< 0.01
Total activity in gases released		0.21

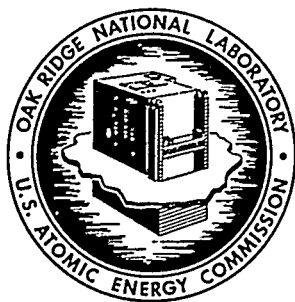
^aActivity primarily ¹³¹I as noted in text

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LIQUID WASTE

Release to Clinch River

Radioactive contamination of the Clinch River resulting from ORNL discharges during the month of November, 1971, was 0.09% of the MPC_W (see Figure 1). The concentrations of the main contaminants, ^{90}Sr , ^3H , and ^{131}I , were 0.07% MPC_W , 0.02% MPC_W , and 0.003% MPC_W , respectively.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the White Oak Creek sampling station are listed in Table 1. A monthly comparison of the strontium activity released into White Oak Lake is shown in Figure 2.

Process Waste

A total of 3.2 million gallons of contaminated water was chemically treated this month. Analyses of the Waste Treatment Plant influent and effluent streams indicate that the removal efficiencies were 67% and 68% for the ^{90}Sr and gross-beta activities, respectively. A monthly comparison of the strontium activity released from the process-waste system to White Oak Creek is shown in Figure 3. Table 2 lists the sources of waste discharged into the system and compares the ^{90}Sr and gross-beta discharges from these sources.

Intermediate-Level Waste

The waste evaporator operated at an average boil-down rate of 322 gph. A summary of operating data is listed below:

	<u>Gallons</u>
Total volume generated	191,000
Volume transferred to Evaporator	232,000
Tank Farm free space at beginning of month	250,000
Tank Farm free space at end of month	284,000
Evaporator concentrate returned to Tank Farm	7,000
Volume of concentrate available for hydrofracture	217,000

A list of the major contributors of intermediate-level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Gallons</u>
Building 3019	17,100
Fission Products Development Laboratory	28,700
ORR and BSR	13,050
High-Flux Isotope Reactor	13,150
Radioisotopes Processing Area	21,300
4500 Complex	21,500

GASEOUS WASTE

The ORNL stacks discharged 110 millicuries of ^{131}I this month. The filterable particulate activities released during the period amounted to 194 microcuries. Inert gases released from the 3039 and 7911 stacks averaged less than 1.6% and 0.4%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Figure 6.

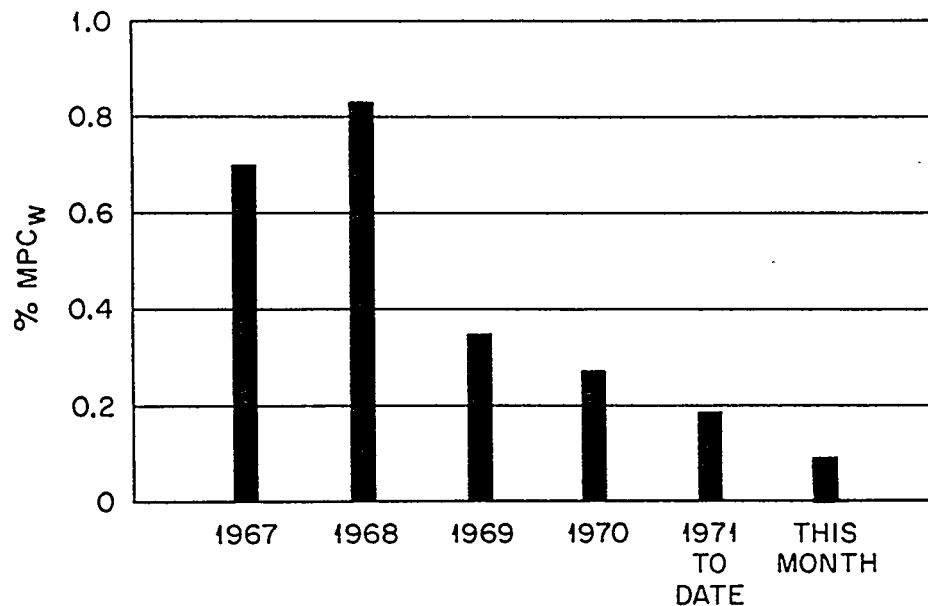


Fig. 1. Calculated Percent of MPC in Clinch River Due to ORNL Discharges. (Health Physics Measurements at White Oak Dam)

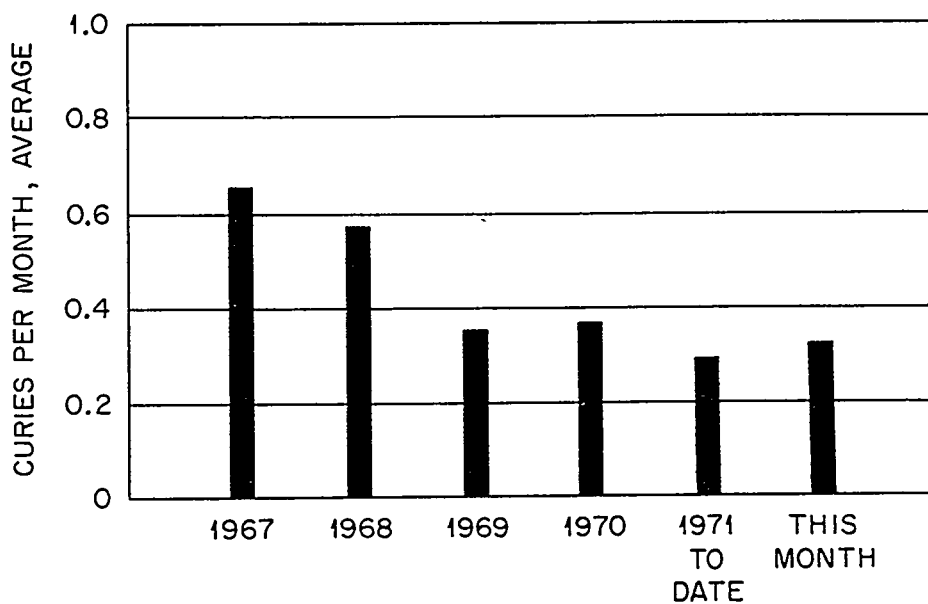


Fig. 2. Total ⁸⁹Sr and ⁹⁰Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 7).

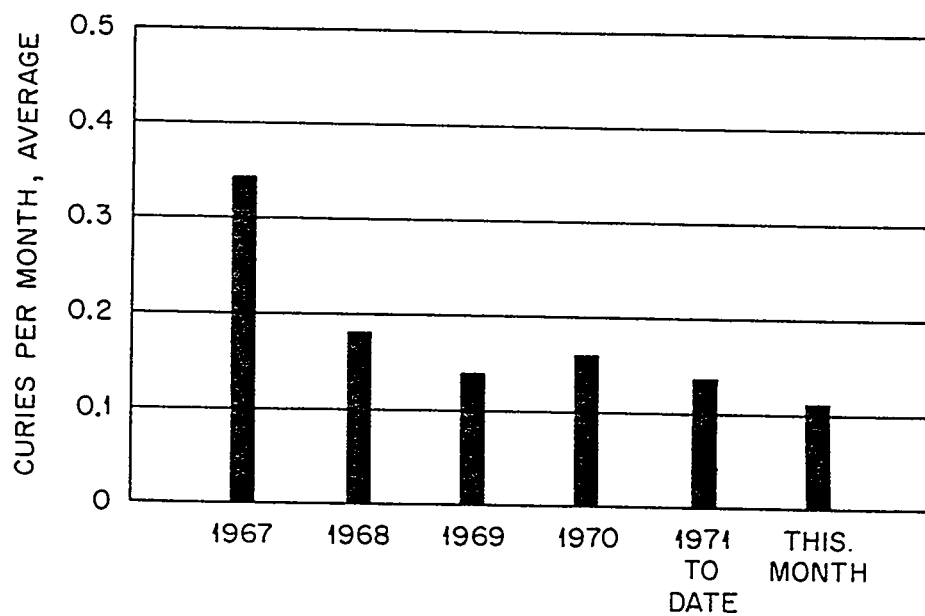


Fig. 3. ^{89}Sr and ^{90}Sr Discharge in Process Waste to White Oak Creek.

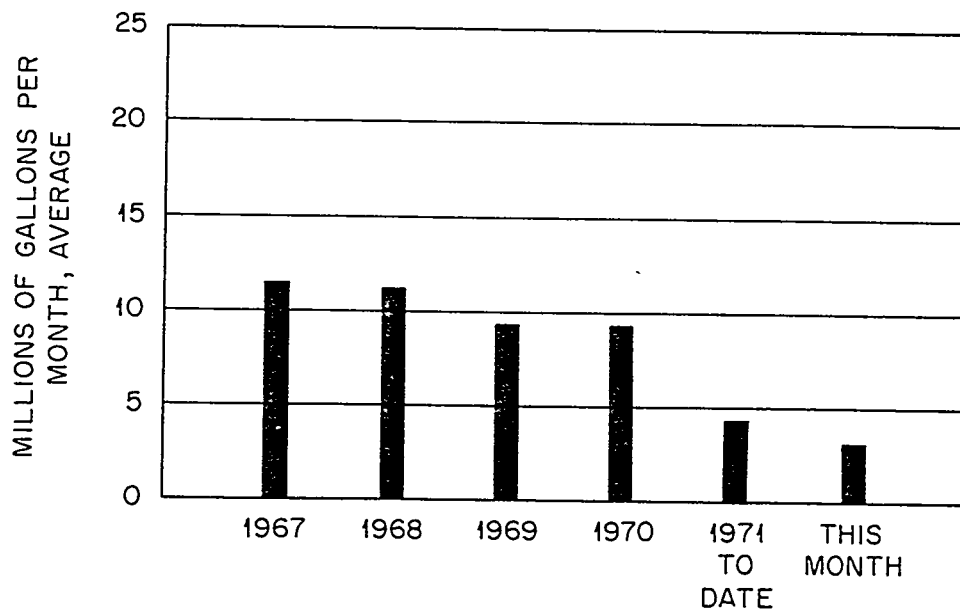


Fig. 4. Process Waste Volumes.

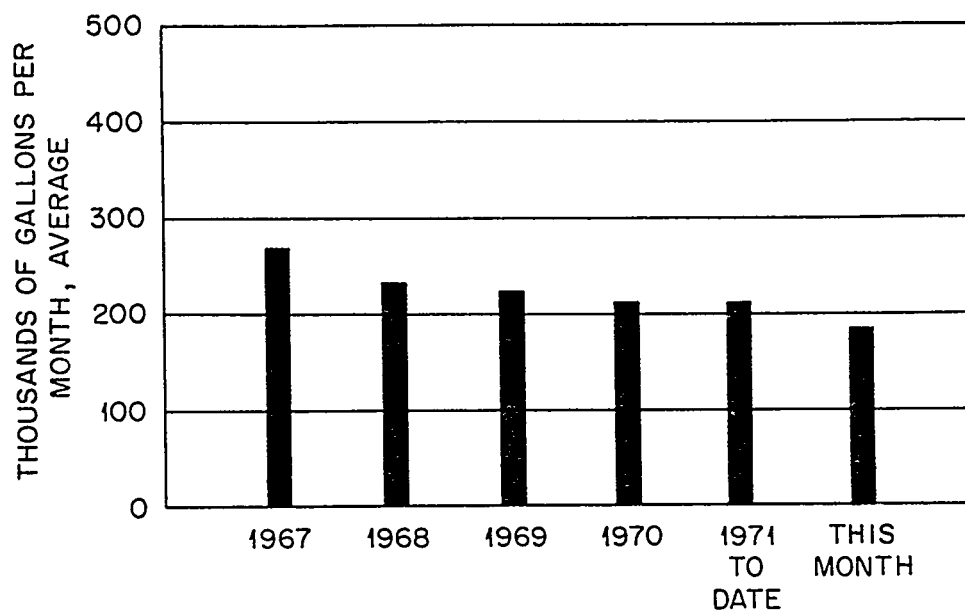


Fig. 5. Intermediate-Level Waste Volumes.

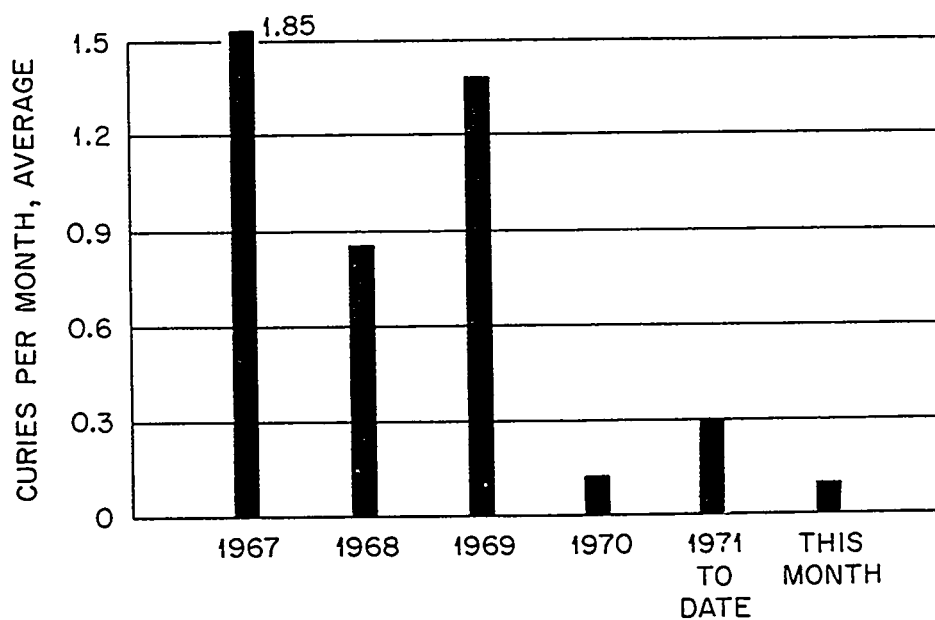


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-adsorbable Species). ORNL's Maximum Permissible Operating Level is 13 curies Per Quarter.

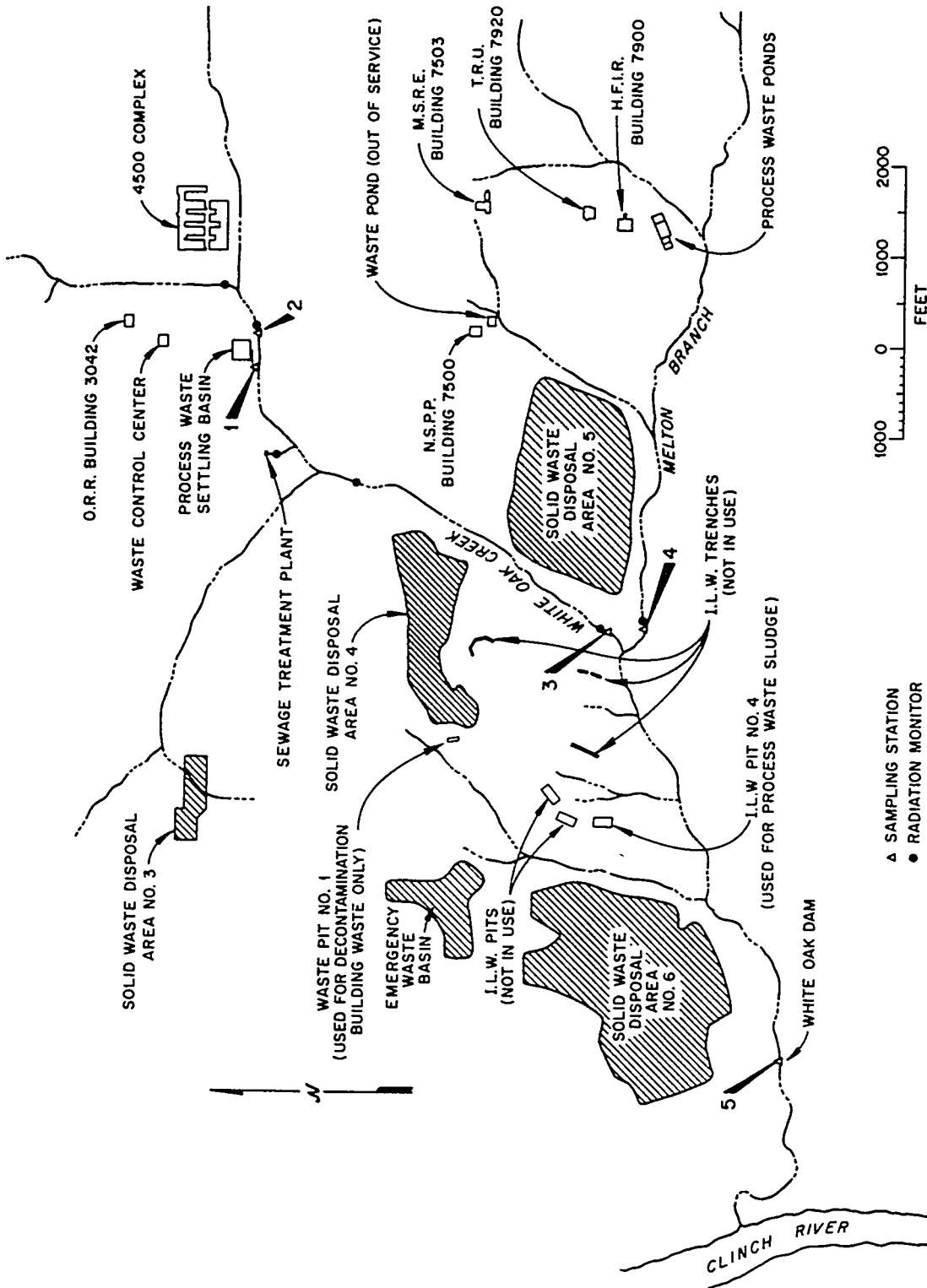


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released in Liquid Wastes to White Oak Creek

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta, Curies ^b
Process waste	1	0.11	0.23
Miscellaneous discharges from east end of plant	2	0.01	0.10
Discharge from Bethel Valley area	3	0.28	0.59
Discharge from Melton Valley area	4	0.05	0.13
Total discharge from all sources	3, 4	0.33	0.72
White Oak Dam to Clinch River (Health Physics measurement)	5	0.11	0.28

^aRefers to Figure 7.

^b Approximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

Stack	Gross-Beta Activity Average c/m/ml ^a	⁹⁰ Sr		Volume	
		Curies	% of Total	Million Gallons	% of Total
1. Radioisotopes Processing Area (MH234)	264	0.08	18.2	0.14	2.9
2. Radioisotopes Processing Area (MH114 minus MH112)	-	0.25 ^b	56.8	0.94	19.7
3. Reactor Operations (MH112)	6.6	<0.01	-	0.30	6.3
4. Buildings 3503 and 3508	6.9	0.02	4.5	1.13	23.7
5. Buildings 3025 and 3026	12.2	<0.01	-	0.18	3.8
6. Building 3019	38.8	<0.01	-	0.03	0.6
7. Fission Products Development Laboratory	-	<0.01	-	0.03	0.6
8. Waste Evaporator, Bldg. 2531	42	0.09	20.5	1.43	30.0
9. Buildings 3525 and 3550	<1	<0.01	-	0.38	8.0
10. Building 2026	<1	<0.01	-	0.21	4.4

^aCounted at 30% geometry.

^bThe activity entered the process-waste system with inleakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Area	Stack No.	Activity ^a (curies)	Filterable Particulate Activity ^b (microcuries)
HRLAL	2026	<0.01	<1
Central Radioactive Gas Disposal Facilities	3039	0.11	129
Radiochemical-Processing Pilot Plant	3020	<0.01	4
MSRE	7512	<0.01	<1
HFIR	7911	<0.01	61
Total activity in gases released		0.11	194

^aActivity primarily ¹³¹I as noted in text.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

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CENTRAL FILES NUMBER

ORNL/CF-82/89

DATE: May 14, 1982

SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent
Monitoring Report for the Month of January 1982.

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of January was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 344.2 mCi. Drainage from the burial grounds, contaminated flood plains, and the dormat pit disposal area accounted for 70 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 391 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of January 1982 was 0.2% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 83.7% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.391 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 108×10^4 and 32×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 338.3 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 1.2 mCi of ^{90}Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ^{90}Sr was released from the 190 pond system; and an additional 76.7 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	13.5	
190 Ponds	0.2	
Process Waste Treatment Plant	1.2	
Sewage Treatment Plant	<u>76.7</u>	
	91.6	
7500 Sampling Station	186.5	
Burial Grounds Nos. 1 and 3, and Flood Plains		94.9
Station No. 3	277.7	
Burial Ground No. 4		91.2

Melton Branch

7900 Area (HFIR and TRU)	0.7	
7500 Area (NSPP and MSRE)	<u>11.2</u>	
	11.9	
Station No. 4	60.6	48.7
Burial Ground No. 5		

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>5.8</u>	
	5.9	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)	344.2	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		240.7
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		69.9

Process Waste

A total of 2.26×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 1.77×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as back-washing of filters.

A monthly comparison of the strontium activity released from the process-waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
569	B	38	748
570	C	40.5	920
571	A	41	778
572	B	47	801
573	C	55.5	976
574	A	48	817
575	B	39.5	722
576	C	50.5	860
577	A	53	940
578	B	47	888
579	C	43	830
580	A	28	477
581	B	38	647
582	C	46.5	791
583	A	38.5	750
584	B	41	931
585	C	42.5	928
586	A	36	743

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
587	B	38	647
588	C	43.5	741
589	A	43	732
590	B	38.5	656
591	C	46	783
592	A	34	580
593	B	40.5	736
594	C	42	715
595	A	48.5	826
596	B	41	699
597	C	41	920

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.73 m³/hr.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	552.9
Volume transferred to evaporators	544.0
South Tank Farm Inventory:	
No change during the period	596.8
Service Tank Inventory:	
W-21, Beginning of Month	29.6
W-21, End of Month	30.7
W-22, Beginning of Month	40.9
W-22, End of Month	48.7
W-23, Beginning of Month	56.6
W-23, End of Month	79.2
Melton Valley Waste Storage Facility Inventory:	
Total Volume at beginning of Month	730.7
Total Volume at end of Month	730.7

Preoperational testing of the equipment at the New Hydrofracture Facility (Bldg. 7860) continued through the reporting period.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Building 3019	49.8
Building 3508	2.2
Building 3503	4.9
Building 3525	4.8
Radioisotopes Processing Area	106.4
ORR and BSR	110.2
High Flux Isotope Reactor	20.0
Fission Products Development Laboratory	41.6*
4500 Complex	42.6
Building 3544	43.8
Transuranium Processing Area	17.5

Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than $249 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 0.6% and 0.7% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

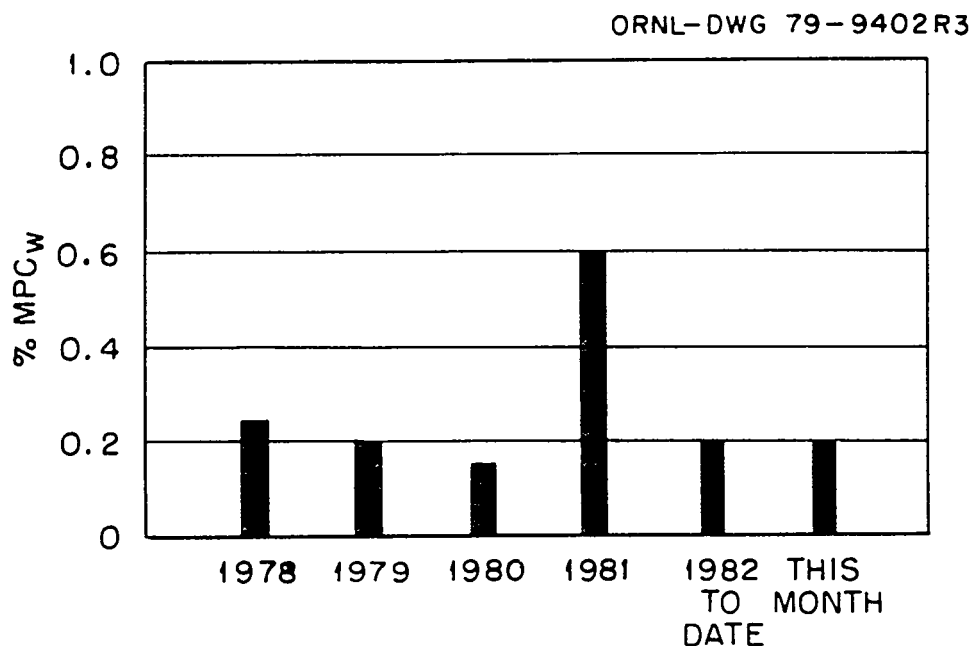


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

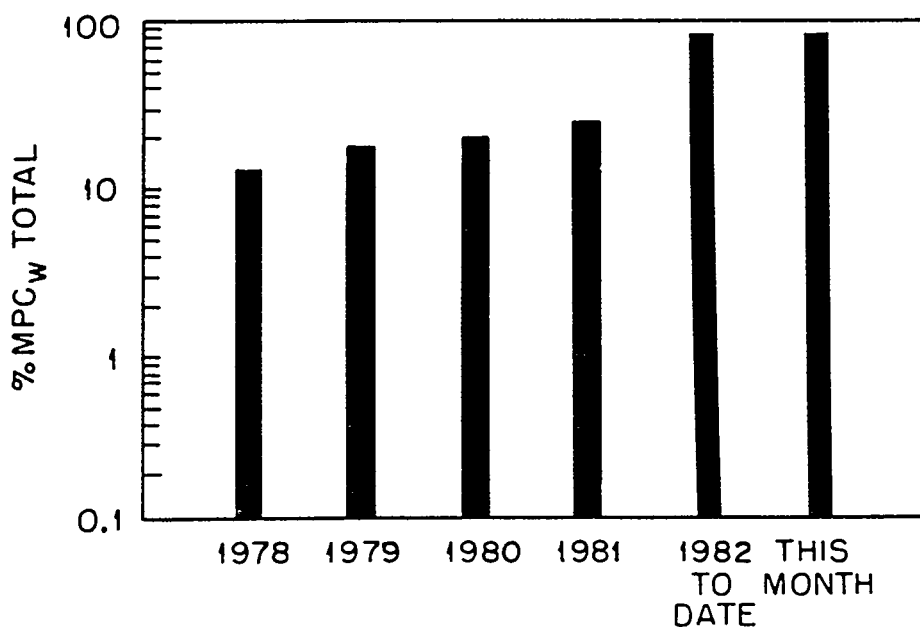


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

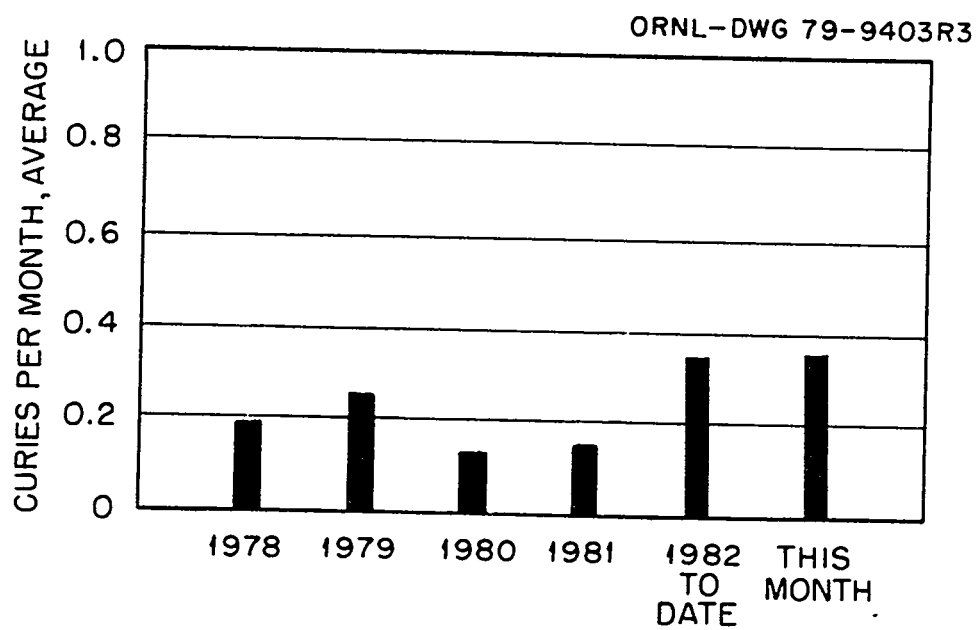


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7).

ORNL-DWG 79-9404R3

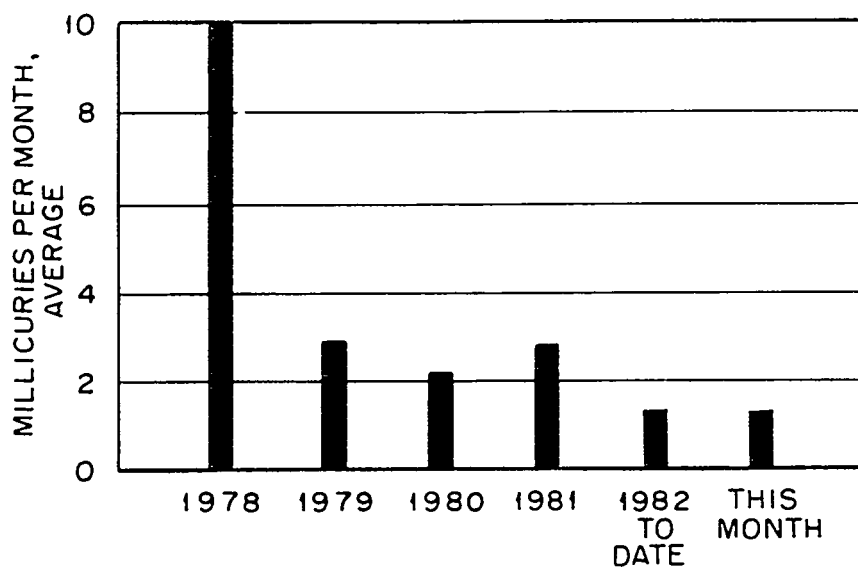


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

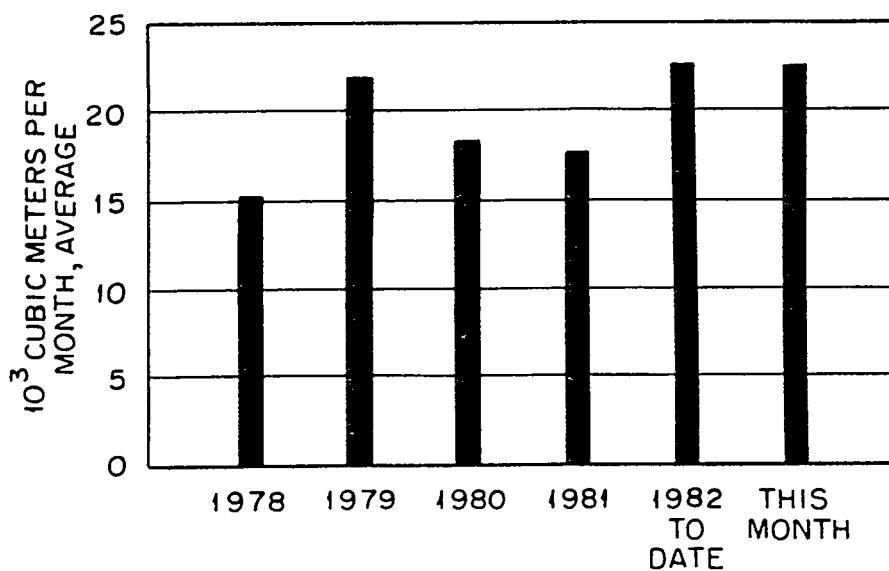


Fig. 4. Process Waste Volumes.

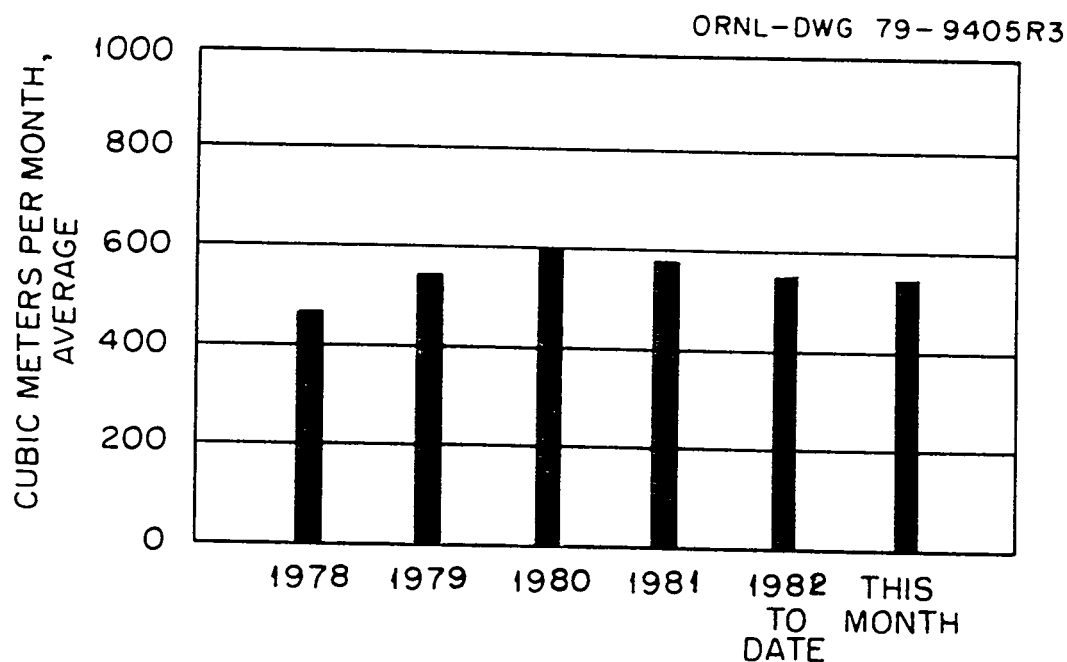


Fig. 5. Intermediate-Level Waste Volumes.

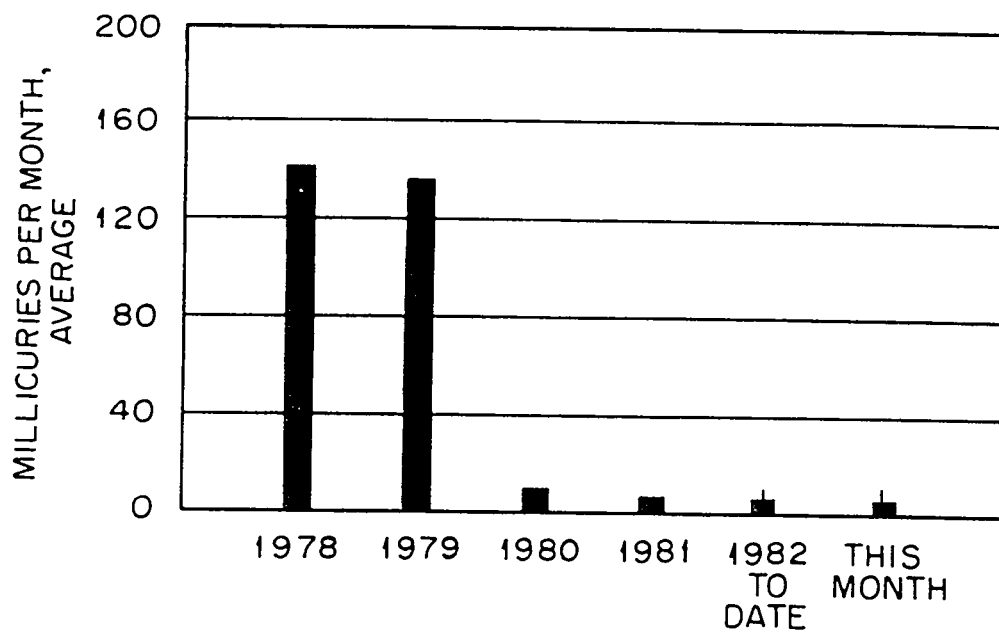


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

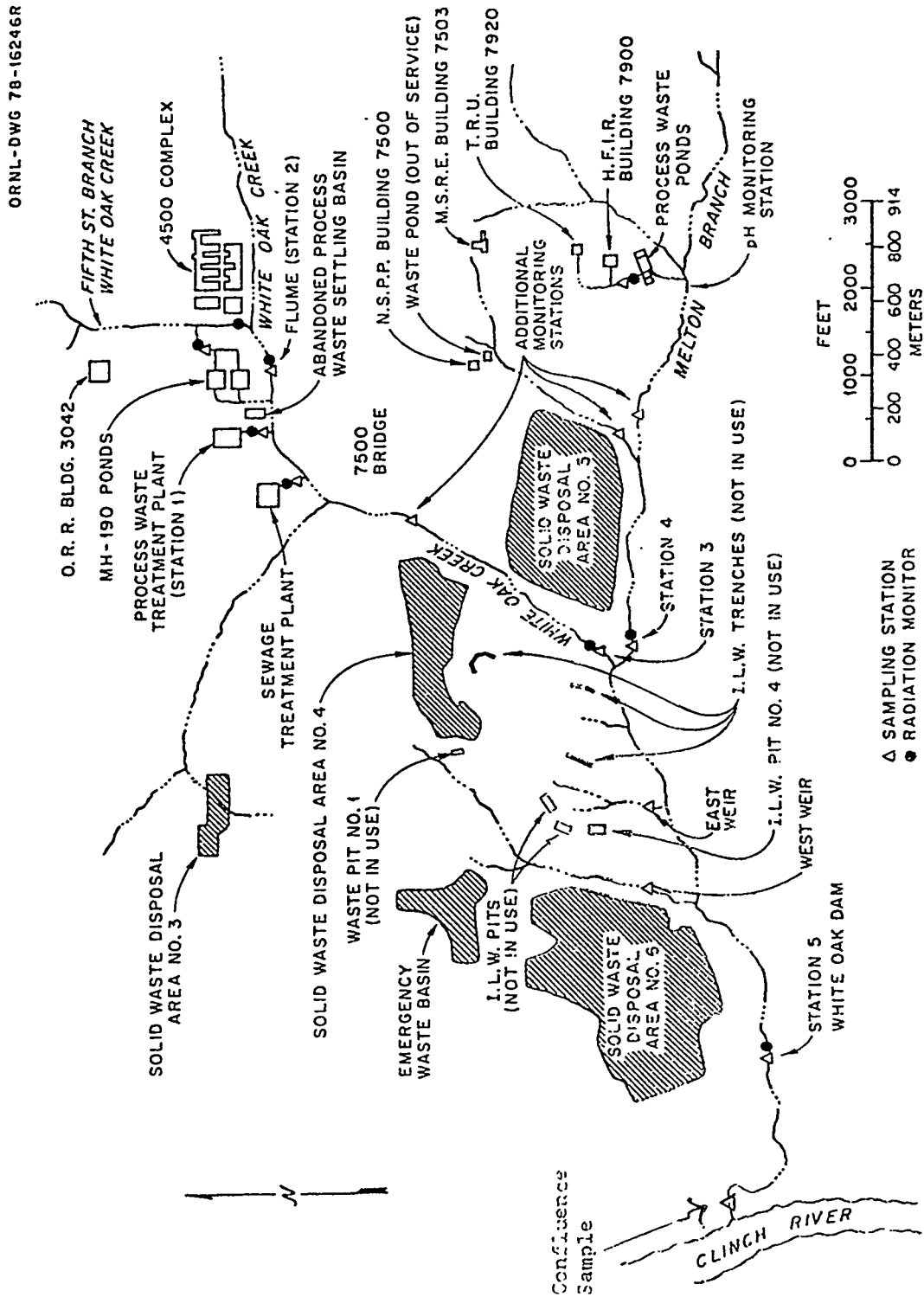


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.2777	0.672
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0606	0.121
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0058	-----
Total discharge from all sources		0.3442	0.793
White Oak Dam to Clinch River (ISAHP Measurement)		0.391	0.127

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr Bq/l	⁹⁰ Sr			Volume	
		Curies	% of Total	10 ³ m ³	% of Total	
Radioisotopes Processing Area (MH234)	2100	0.241	22.5	4.24		19.4
Radioisotopes Processing Area (MH114 minus MH112)	----	0.302 ^a	28.2	2.17		9.9
Reactor Operations (MH112)	73	0.008	0.7	3.88		17.7
Buildings 3503 and 3508	1.3	<0.001	----	1.35		6.2
Buildings 3025 and 3026	110	0.005	0.5	1.56		7.1
Building 3019	280	0.011	1.0	1.49		6.8
Waste Evaporator, Bldg. 2531	3100	0.113	10.6	1.35		6.2
Building 3525	2	<0.001	----	1.75		8.0
Building 2026	7.1	<0.001	----	1.04		4.7
Tank Farm Drainage	4700	0.391	36.5	3.08		14.0

^aThe activity entered the process-waste system with leakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL	< 0.01	< 1
Central Radioactive Gas Disposal Facilities	< 0.01	170
Radiochemical-Processing Pilot Plant	< 0.01	36
MSRE	< 0.01	< 1
HFIR and TRU	< 0.01	43
Total Activity in Gases Released at X-10 Site	< 0.01	249
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	³ H 122	
Building 4508 Ventilation Discharges Room 136		1.54 x 10 ⁻³
Room 265		3.50 x 10 ⁻⁴
Building 5505 Discharges Glove Box		2.25 x 10 ⁻³
Hood		3.87 x 10 ⁻²

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.

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DATE: May 17, 1982

SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent
Monitoring Report for the Month of February 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

Donald C. Hamm 7/15/82
Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of February was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 416.5 mCi. Drainage from the burial grounds, contaminated flood plains, and the dormant pit disposal area accounted for 76 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 365 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 1 mCi.

There was one Unusual Occurrence (Report No. OP-83-1) during the period.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of February 1982 was 0.2% of the MPC_W (Fig. 1A). The sampler at the confluence of White Oak Creek and the Clinch River malfunctioned this month; hence, the contamination level (MPC_W , Fig. 1B) at this sample point, which represents the maximum percentage MPC_W in the river that could result from ORNL waste releases, is not available.

During the month, 0.365 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 115×10^4 and 34×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 411.1 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.9 mCi of ^{90}Sr was released by the Process Waste Treatment Plant; 0.1 mCi of ^{90}Sr was released from the 190 pond system; and an additional 73.3 mCi of ^{90}Sr were released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	10.2	
190 Ponds	0.1	
Process Waste Treatment Plant	0.9	
Sewage Treatment Plant	<u>73.3</u>	
	84.5	
7500 Sampling Station	234.7	
Burial Grounds Nos. 1 and 3, and Flood Plains		150.2
Station No. 3	342.0	
Burial Ground No. 4		107.3

Melton Branch

7900 Area (HFIR and TRU)	0.8	
7500 Area (NSPP and MSRE)	<u>14.7</u>	
	15.5	
Station No. 4	69.1	
Burial Ground No. 5		53.6

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>5.3</u>	
	5.4	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)	416.5	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		316.5
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		76.0

Process Waste

A total of 1.86×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 1.76×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as back-washing of filters.

A monthly comparison of the strontium activity released from the process waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
598	A	37.5	673
599	B	48	817
600	C	46.5	796
601	A	48	817
602	B	32	545
603	C	38	783
604	A	33	750
605	B	41	823
606	C	34.5	587
607	A	42.5	724
608	B	40	719
609	C	46	816
610	A	32.5	587
611	B	33	852
612	C	46.5	833
613	A	36.5	618
614	B	39	664
615	C	38.5	656
616	A	43.5	699
617	B	29.5	503
618	C	43	732
619	A	46.5	806
620	B	31	477
621	C	20.5	454
622	A	46	1,045
623	B	40.5	829

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.55 m³/hr.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	392.5
Volume transferred to evaporators	371.1
South Tank Farm Inventory:	
No change during the period	596.8
Service Tank Inventory:	
W-21, Beginning of Month	30.7
W-21, End of Month	52.1
W-22, Beginning of Month	48.7
W-22, End of Month	57.7
W-23, Beginning of Month	79.2
W-23, End of Month	105.3
Melton Valley Waste Storage Facility Inventory:	
Total volume at beginning of Month	730.7
Total volume at end of Month	770.4

This volume increase is due to the addition of 39.7m³ of a nonradioactive high pH solution to W-30. This solution was produced during the testing of the dry solids handling system at the New Shale Fracture Facility. It will be disposed of during a future test injection at the Shale Fracture Site.

Preoperational testing of the New Hydrofracture Facility was completed during the period.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Building 3019	32
Building 3508	3.6
Building 3503	11.9
Building 3525	8.0
Radioisotopes Processing Area	60.2
ORR and BSR	99.3
High Flux Isotope Reactor	22.4
Fission Products Development Laboratory	7.6*
4500 Complex	35.5
Building 3544	50.0
Transuranium Processing Area	10.1

Gaseous Waste

The ORNL Stacks discharged < 1 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than $56 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 0.8% and 0.4% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

Unusual Incidents

The upper pH limit of 9.0 was exceeded at NPDES Reporting Station No. 4 when an alkaline cement slurry was allowed to drain into the Melton Branch watershed from the New Hydrofracture Facility. The cement was slurried during the final phase of a preoperational test of the bulk handling system of the facility.

The incident is summarized in ORNL Unusual Occurrence Report No. OP-82-1.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW, since it was designed in this fashion.

ORNL-DWG 79-9402R3

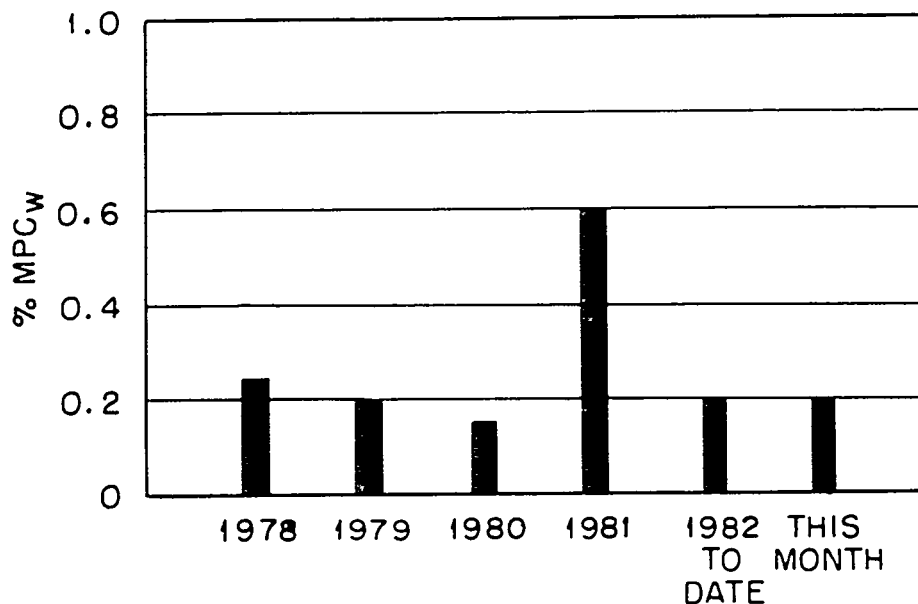


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

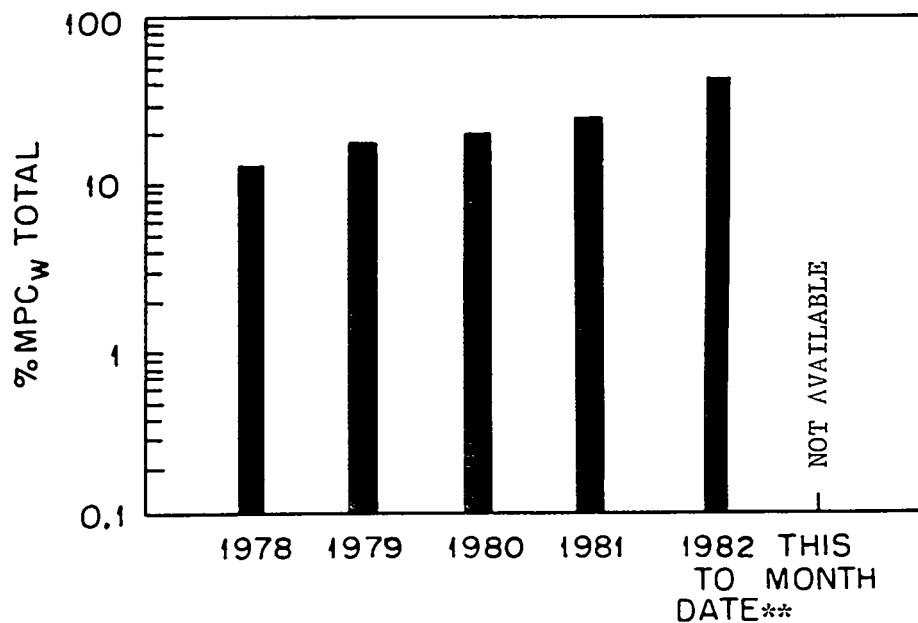


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

** Not including February (data not available).

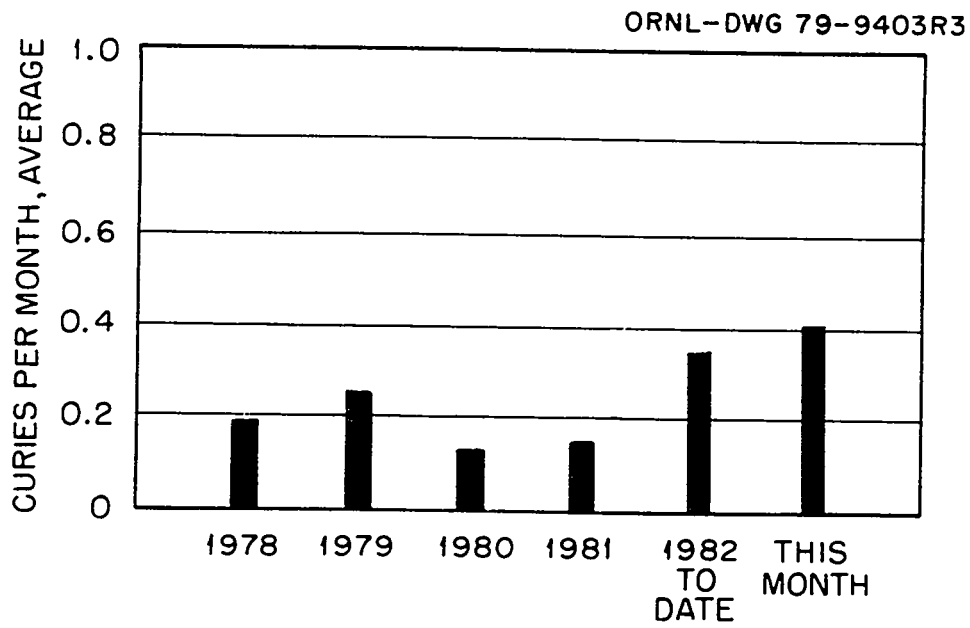


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7).

ORNL-DWG 79-9404R3

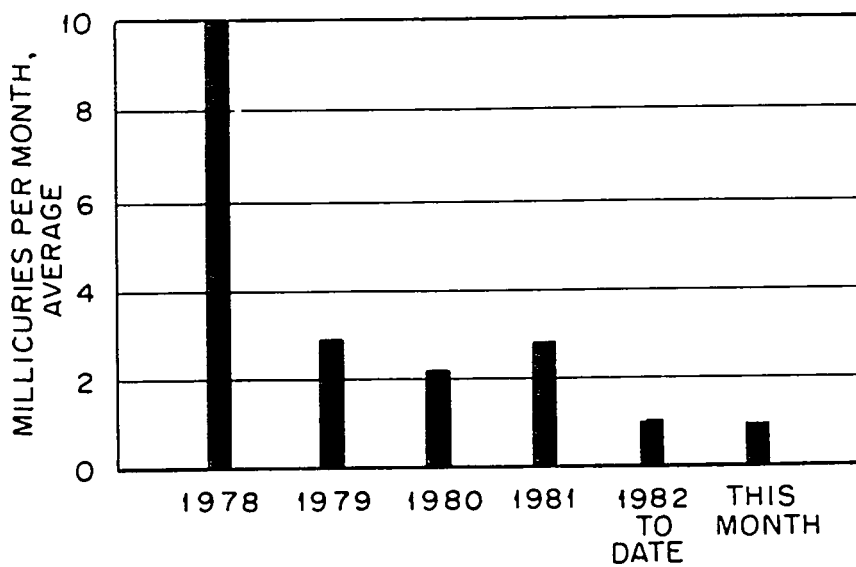


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

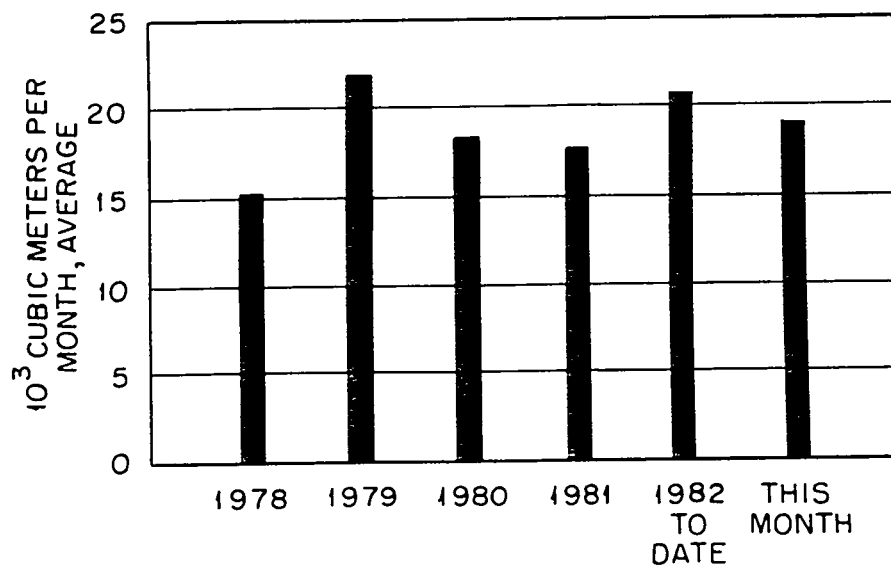


Fig. 4. Process Waste Volumes.

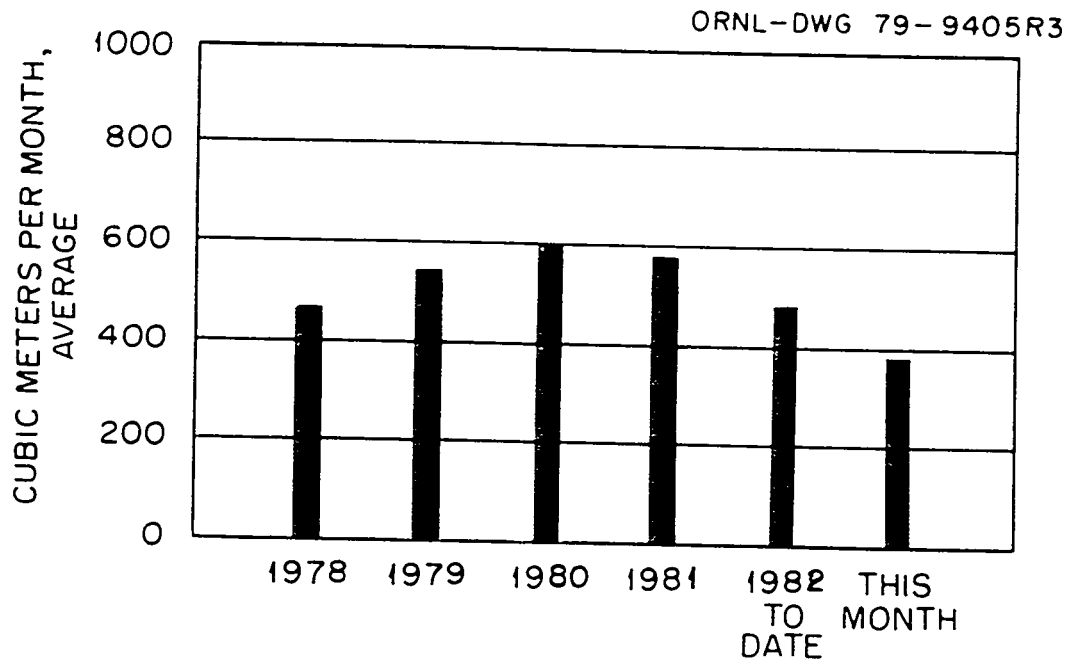


Fig. 5. Intermediate-Level Waste Volumes.

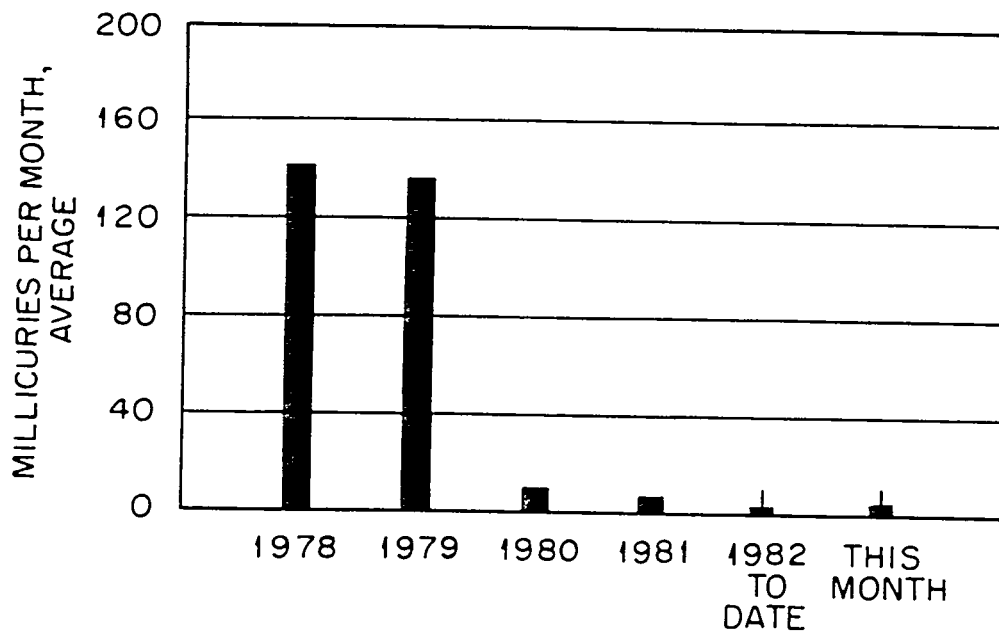


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

ORNL-DWG 78-16246R

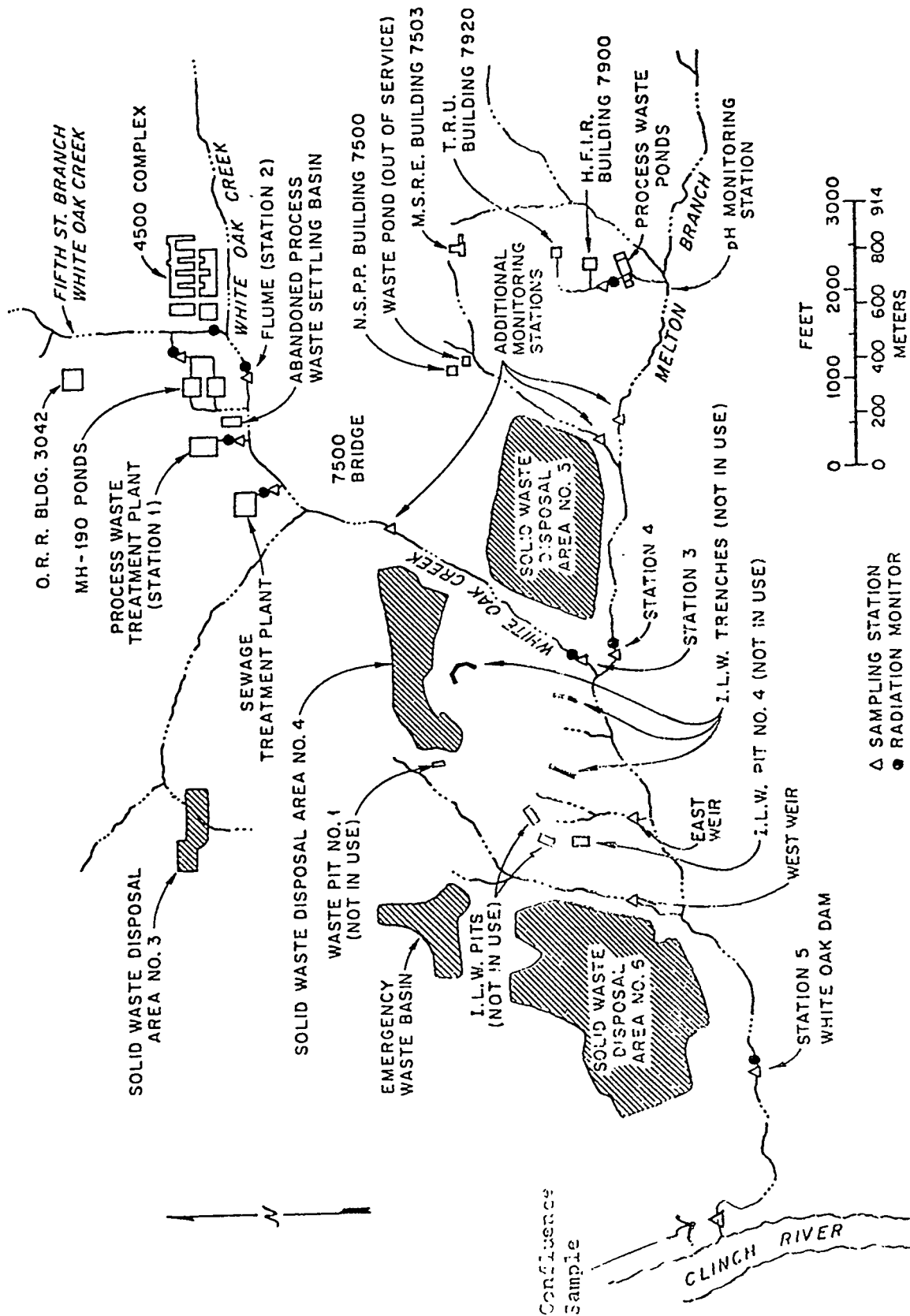


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.3420	1.026
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0691	0.104
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0053	-----
Total discharge from all sources		0.4165	1.130
White Oak Dam to Clinch River (ISAHP Measurement)		0.3649	0.892

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr BQ/l	⁹⁰ Sr			Volume	
		Curies	% of Total	10 ³ m ³	% pf Total	
Radioisotopes Processing Area (MH234)	1600	0.182	24.0	4.20	20.1	
Radioisotopes Processing Area (MH114 minus MH112)	----	0.312 ^a	41.1	3.54	16.9	
Reactor Operations (MH112)	44	0.004	0.5	3.34	16.0	
Buildings 3503 and 3508	0.5	<0.001	----	1.47	7.0	
Buildings 3025 and 3026	13	<0.001	----	1.64	7.8	
Building 3019	90	<0.003	0.4	1.31	6.3	
Waste Evaporator, Bldg. 2531	52	0.001	0.1	1.03	4.9	
Building 3525	1.8	<0.001	----	1.56	7.5	
Building 2026	2.6	<0.001	----	0.86	4.1	
Tank Farm Drainage	4800	0.257	33.9	1.98	9.4	

^aThe activity entered the process-waste system with inleakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.


Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL, 2026	< 0.01	< 1
Central Radioactive Gas Disposal Facilities 3039	< 0.01	41
Radiochemical-Processing Pilot Plant 3020	< 0.01	5
MSRE 7512	< 0.01	<1
HFIR and TRU 7911	< 0.01	10
Total Activity in Gases Released at X-10 Site	< 0.01	56
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	1 (³ H)	
Building 4508 Ventilation Discharges Room 136		1.54 x 10 ⁻³
Room 265		5.60 x 10 ⁻⁴
Building 5505 Discharges Glove Box		2.25 x 10 ⁻³
Hood		3.87 x 10 ⁻²

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.

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DATE ISSUED JUN 24 1982

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CENTRAL FILES NUMBER

ORNL/CF-82/91

DATE: May 18, 1982

SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent
Monitoring Report for the Month of March 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:


Technical Information Officer Date 7/15/76
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of March was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 513.0 mCi; drainage from the burial grounds, contaminated flood plains, and the dormant pit disposal area accounted for 77 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 530 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of March 1982 was 0.3% of the MPC_W (Fig 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 18.8% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.530 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 128×10^4 and 38×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 505.8 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.5 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.3 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 83.3 mCi of ⁹⁰Sr was released from the sanitary system. This release is higher than the amount reported last month, and it reflects the precipitation rate which increased during the period.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge

into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	11.1	
190 Ponds	0.3	
Process Waste Treatment Plant	0.5	
Sewage Treatment Plant	83.3	
	<u>95.2</u>	
7500 Sampling Station	233.9	
Burial Grounds Nos. 1 and 3, and Flood Plains		138.7
Station No. 3	413.3	
Burial Ground No. 4		179.4

Melton Branch

7900 Area (HFIR and TRU)	0.9	
7500 Area (NSPP and MSRE)	15.9	
	<u>16.8</u>	
Station No. 4	92.5	
Burial Ground No. 5		75.7

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>7.1</u>	
	7.2	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)	513.0	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		393.8
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		76.8

Process Waste

A total of 2.14×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 2.08×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as back-washing of filters.

A monthly comparison of the strontium activity released from the process-waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
624	C	38	864
625	A	38	862
626	B	34.5	897
627	C	36.5	865
628	A	26	864
629	B	29	659
630	C	33	710
631	A	23.5	631
632	B	32	548
633	C	44	711
634	A	37	641
635	B	25	568
636	C	36	817
637	A	43	642
638	B	34.5	587
639	C	46	817
640	B	30	545
641	C	54.5	958
642	B	50	852
643	A	57	975
644	C	57	921
645	B	59.5	1476
646	A	59	1136
647	C	62	1137
648	B	51	869
649	A	46	870

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.73 m³/hr.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	545.5
Volume transferred to evaporators	539.4
South Tank Farm Inventory:	
No change during the period	596.8
Service Tank Inventory:	
W-21, Beginning of Month	52.1
W-21, End of Month	18.5
W-22, Beginning of Month	57.7
W-22, End of Month	97.4
W-23, Beginning of Month	105.3
W-23, End of Month	134.6
Melton Valley Waste Storage Facility Inventory:	
Total volume at beginning of month	770.4
Total volume at end of month	788.4

The preoperational testing of the New Hydrofracture Facility was completed this month when approximately 30,000 gal of noncontaminated water was slurried and injected into a new slot at a depth of 1096 feet. This injection served the dual purpose of training the service group personnel and demonstrating the mechanical readiness of the disposal plant.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Building 3019	31.9
Building 3508	1.7
Building 3503	3.7
Building 3525	4.7
Radioisotopes Processing Area	65.1
ORR and BSR	112.7
High Flux Isotope Reactor	33.1
Fission Products Development Laboratory	72.0*
4500 Complex	41.3
Building 3544	35.9

Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than $130 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.2% and 0.3% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

Unusual Incidents

During the slotting operation of the test injection at the New Hydrofracture Facility, the slotting tool became plugged with sand and it became necessary to retrieve it from the well. While displacing the tool, the well tubing became plugged with sand and was ejected approximately twenty feet out of the well. Minor damage was sustained to the equipment.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

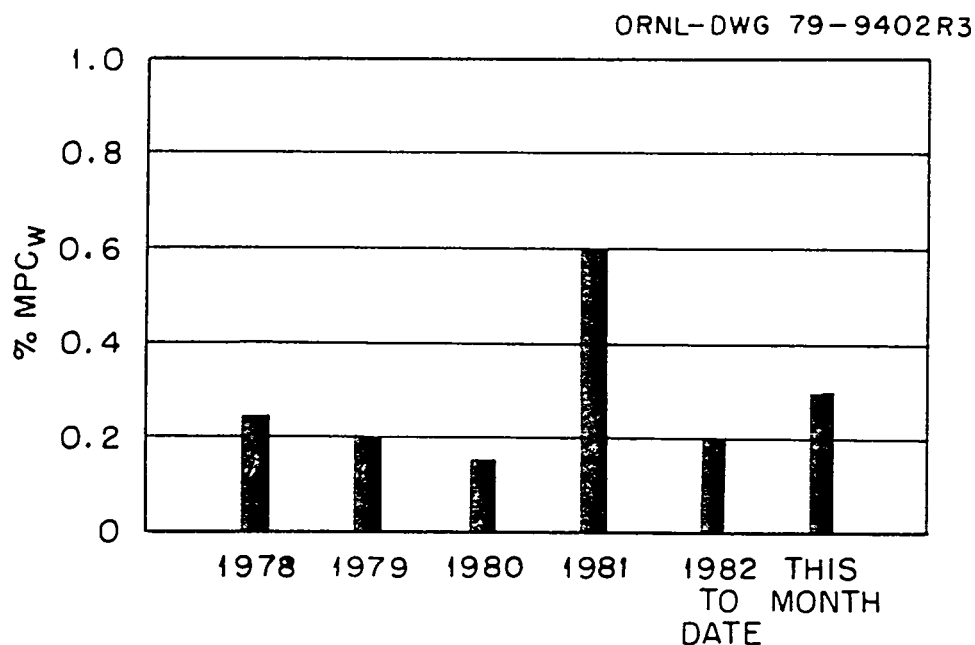


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

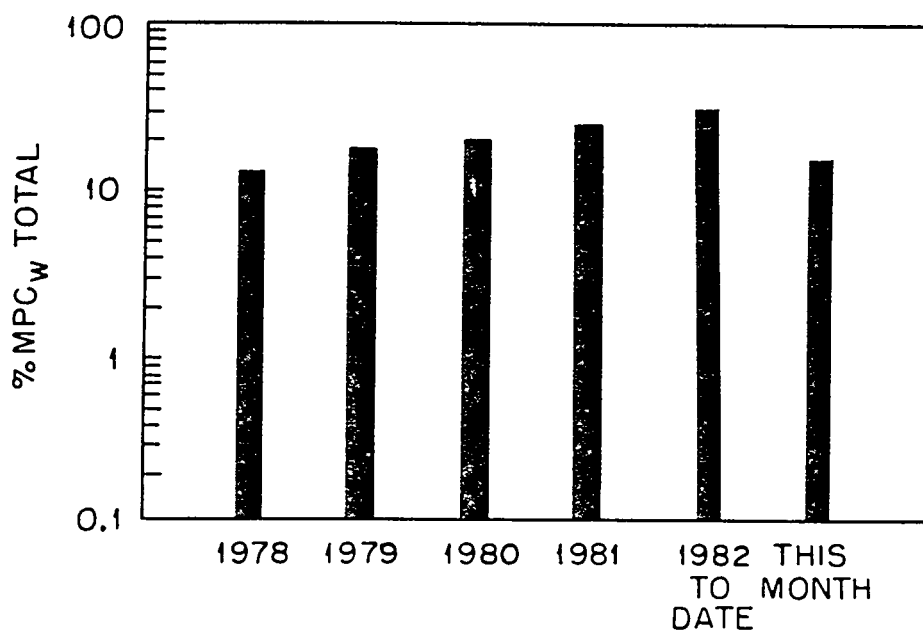


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

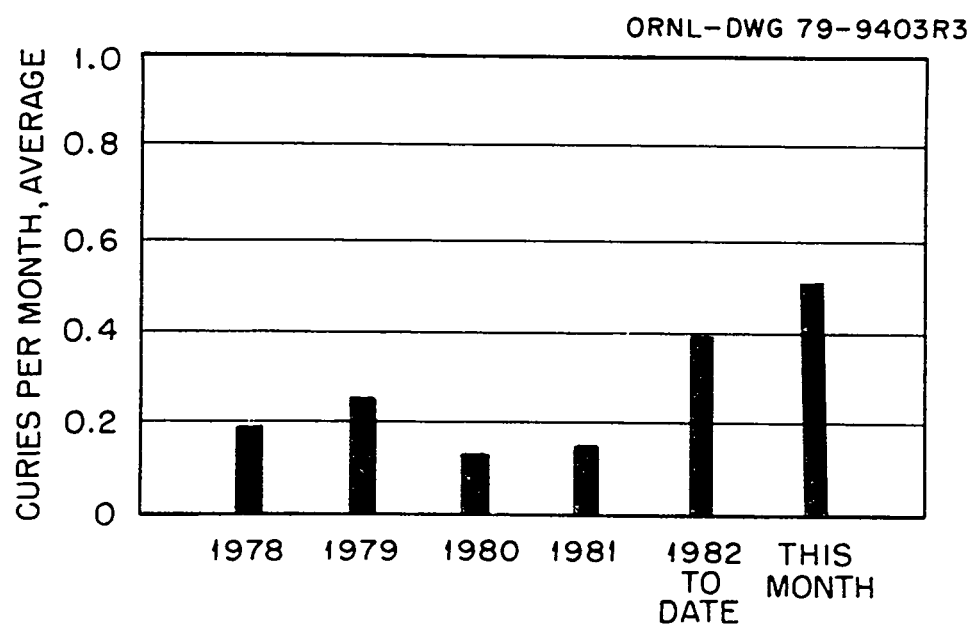


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 7).

ORNL-DWG 79-9404R3

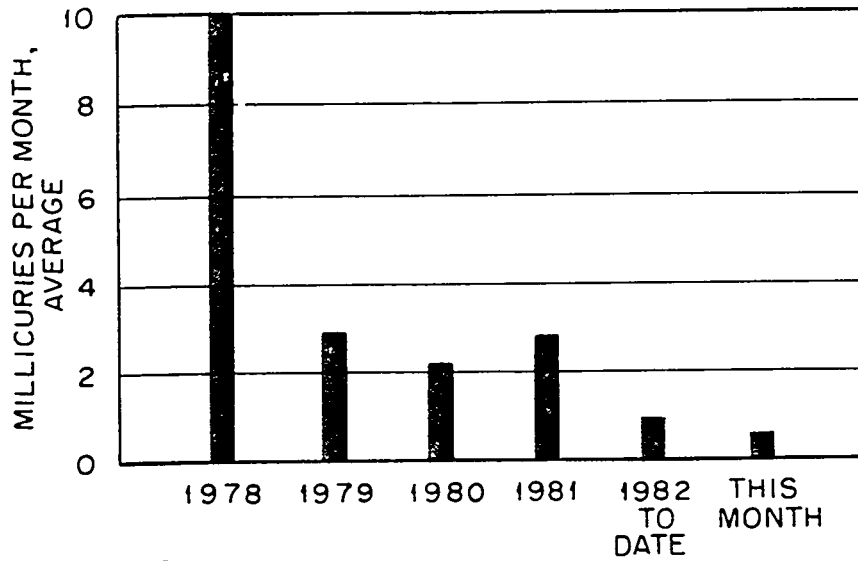


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

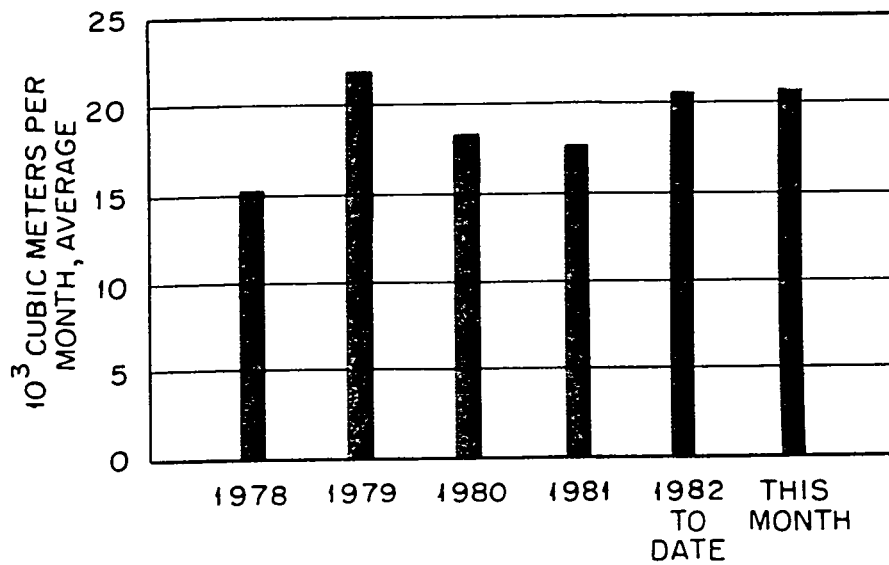


Fig. 4. Process Waste Volumes.

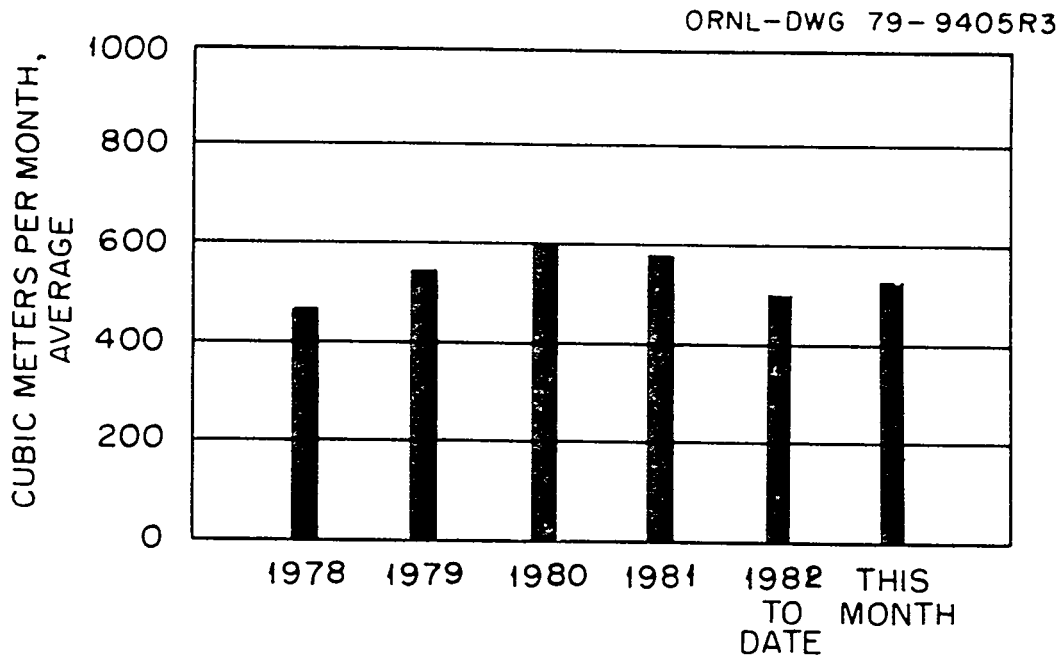


Fig. 5. Intermediate-Level Waste Volumes.

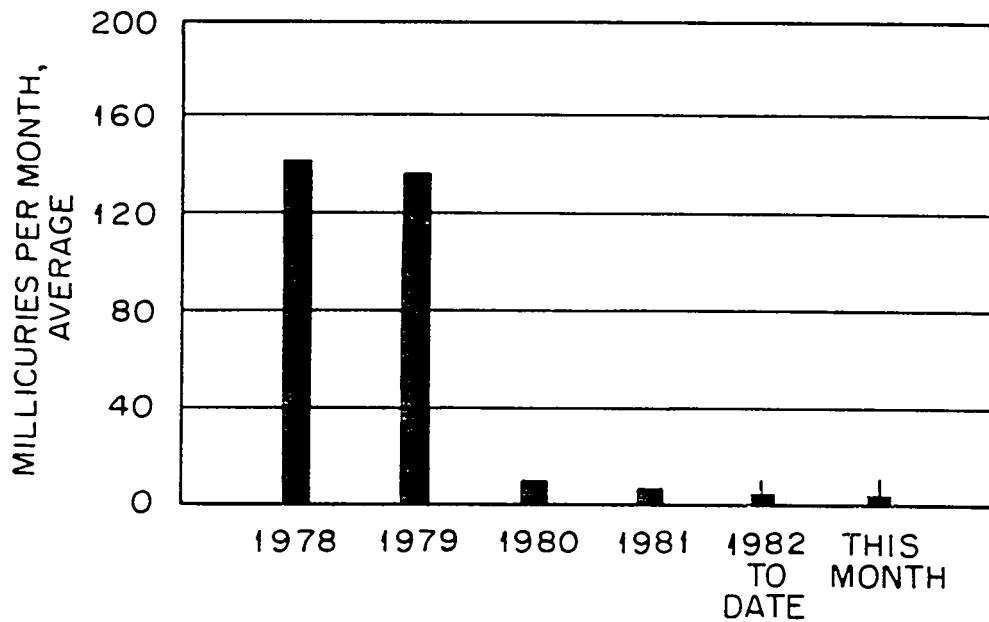


Fig.6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

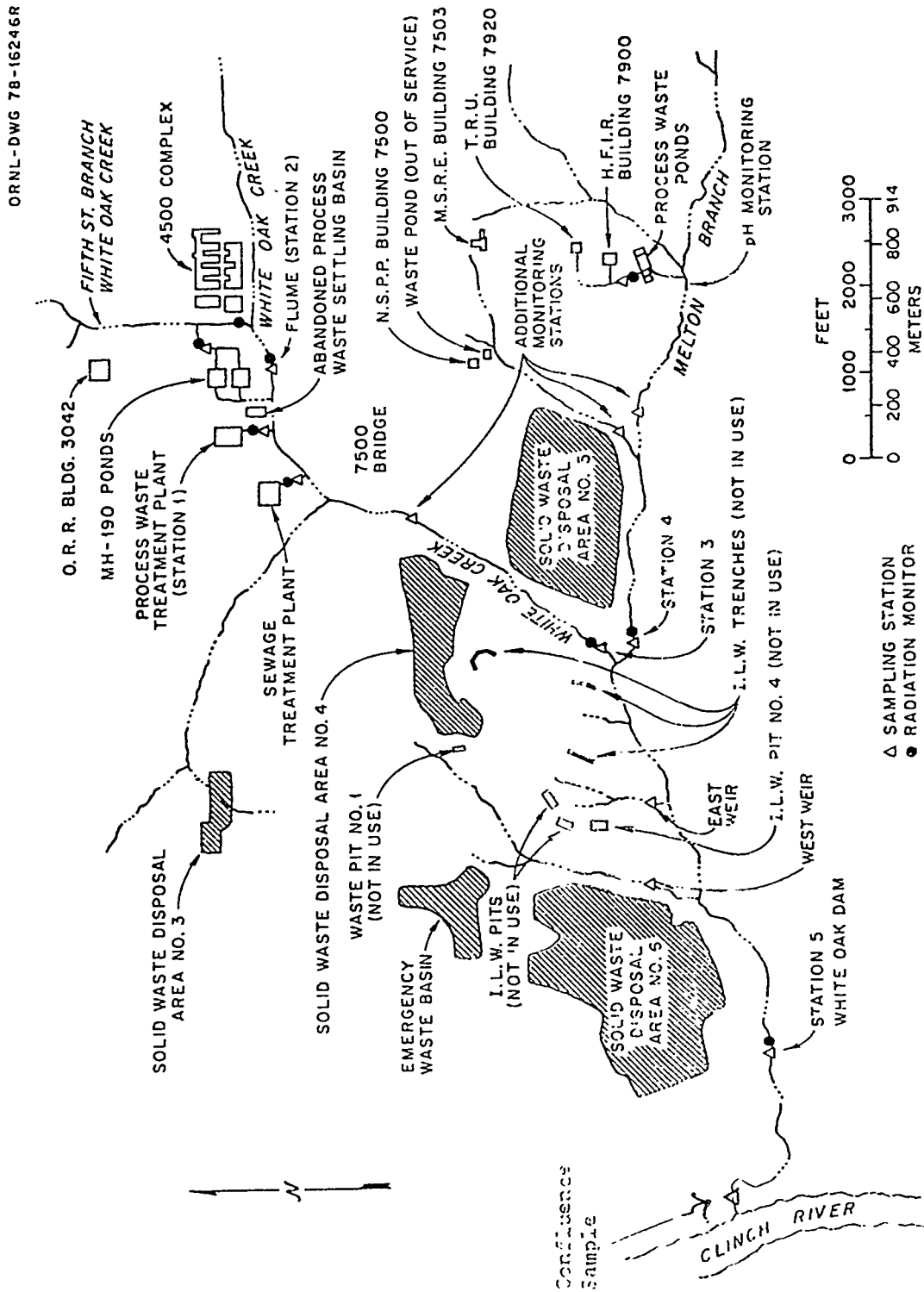


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.4133	1.034
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0925	0.197
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0071	-----
Total discharge from all sources		0.5130	1.231
White Oak Dam to Clinch River (ISAHP Measurement)		0.5298	0.984

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr Bq/k	⁹⁰ Sr			Volume	
		Curies	% of Total	10 ³ m ³	% of Total	
Radioisotopes Processing Area (MH234)	760	0.096	9.5	4.69		18.3
Radioisotopes Processing Area (MH114 minus MH112)	---	0.406	40.0	2.42		9.4
Reactor Operations (MH112)	75	0.012	1.2	5.74		22.4
Buildings 3503 and 3508	1.0	<0.001	---	1.90		7.4
Buildings 3025 and 3026	14	<0.001	---	1.83		7.1
Building 3019	280	0.012	1.5	1.54		6.0
Waste Evaporator, Bldg. 2531	890	0.032	3.2	1.32		5.1
Building 3525	1.6	<0.001	---	1.40		5.5
Building 2026	1.5	<0.001	---	1.29		5.0
Tank Farm Drainage	4800	0.456	44.9	3.52		13.8

^aThe activity entered the process-waste system with inleakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

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Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL	< 0.01	< 1
Central Radioactive Gas Disposal Facilities	< 0.01	50
Radiochemical-Processing Pilot Plant	< 0.01	76 ^d
MSRE	< 0.01	<1
HFIR and TRU	< 0.01	4
Total Activity in Gases Released at X-10 Site	< 0.01	130
Chem. Tech. Division - Y-12 Area		(^c)
Tritium Target Fabrication Building	1 (³ H)	
Building 4508 Ventilation Discharges Room 136		3.08 x 10 ⁻³
Room 265		7.00 x 10 ⁻⁴
Building 5505 Discharges Glove Box		4.50 x 10 ⁻³
Hood		7.75 x 10 ⁻²

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.^dThis figure is higher than usual due to a filter change in the off-gas system of the analytical laboratory at Building 3019.

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CENTRAL FILES NUMBER

ORNL/CF-82/228

DATE: July 15, 1982

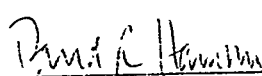
SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and
Effluent Monitoring Report for the Month of April 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored By: J. H. Swanks

This document has been approved for release
to the public by.



Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of April was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 263.3 mCi; drainage from the burial grounds, contaminated flood plains, and the dormant pit disposal area accounted for 77 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 265 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of April 1982 was 0.4% of the MPC_W (Fig 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 22.7% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.265 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 83×10^4 and 19×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 260.8 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.1 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 35.2 mCi of ⁹⁰Sr was released from the sanitary system. This release is lower than the amount reported last month, and it reflects the precipitation rate which decreased during the period.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge

into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	⁹⁰ Sr Discharge (mCi)	
	By <u>Measurement</u>	By <u>Difference</u>
Flume	10.0	
190 Ponds	0.1	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	35.2	
	<u>45.5</u>	
7500 Sampling Station	91.2	
Burial Grounds Nos. 1 and 3, and Flood Plains		45.7
Station No. 3	179.2	
Burial Ground No. 4		88.0

Melton Branch

7900 Area (HFIR and TRU)	1.2	
7500 Area (NSPP and MSRE)	12.0	
	<u>13.2</u>	
Station No. 4	81.6	
Burial Ground No. 5		68.4

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>2.4</u>	
	2.5	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)	263.3	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		202.1
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		76.7

Process Waste

A total of 1.95×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 1.86×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as back-washing of filters.

A monthly comparison of the strontium activity released from the process-waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
650	C	47	1,037
651	B	28.5	501
652	A	34	741
653	B	29	647
654	C	59	1,054
655	A	61	1,020
656	B	58	998
657	C	60	1,004
658	A	44	736
659	B	41	697
660	C	44.5	904
661	A	40.5	947
662	B	40	851
663	C	45.5	981
664	A	28	647
665	B	34.5	769
666	C	42	881
667	A	40.5	904
668	B	34	759
669	C	42.5	947
670	B	36.5	780
671	A	31.5	702

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.49 m³/hr.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	318.0
Volume transferred to evaporators	354.0
South Tank Farm Inventory:	
Beginning of Month	596.8
End of Month	759.4*
Service Tank Inventory:	
W-21, Beginning of Month	18.5
W-21, End of Month	50.4
W-22, Beginning of Month	97.4
W-22, End of Month	19.5
W-23, Beginning of Month	134.6
W-23, End of Month	70.3
Melton Valley Waste Storage Facility Inventory:	
Total volume at beginning of month	788.4
Total volume at end of month	867.5

On April 15, 1982, 88.1 m³ of concentrated waste were transferred from W-23 to MVWSF Tank W-28.

*Increase due to work being done in preparation of Guniting Tank Sludge Removal Facility.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Transuranium Processing Area	6.8
Building 3019	14.8
Building 3525	9.8
Radioisotopes Processing Area	48.4
ORR and BSR	84.8
High Flux Isotope Reactor	21.2
Fission Products Development Laboratory	38.0*
4500 Complex	26.0
Building 3544	16.7

Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than 224 μCi . Inert gases released from the 3039 and 7911 Stacks averaged less than 0.9% and 0.5% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

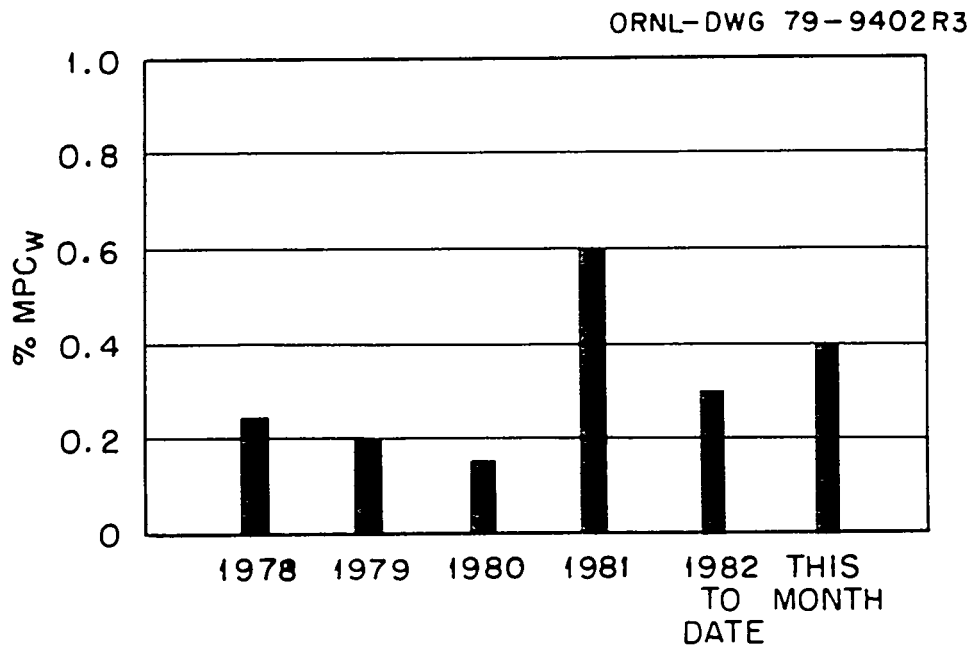


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

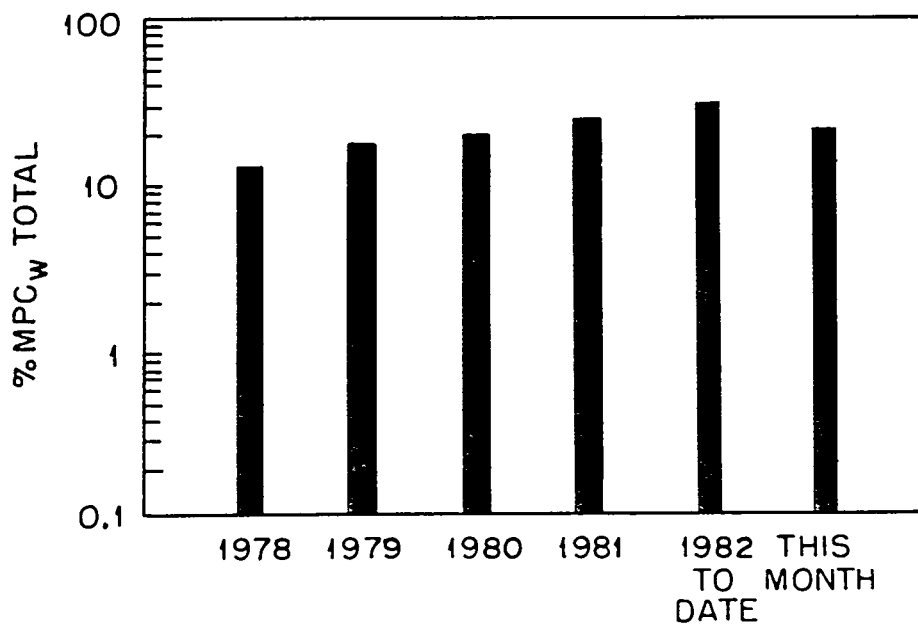


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

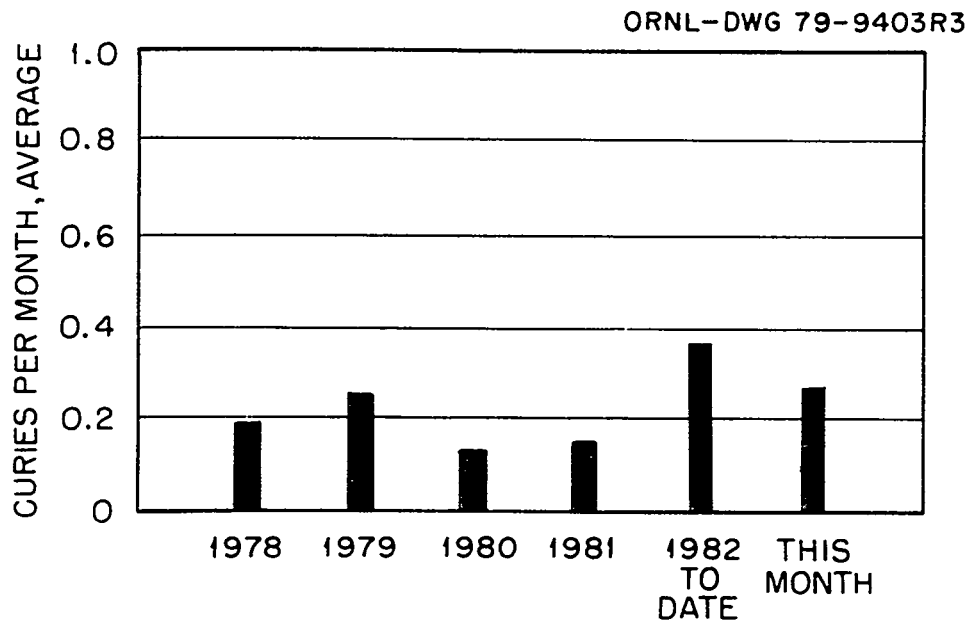


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 7).

ORNL-DWG 79-9404R3

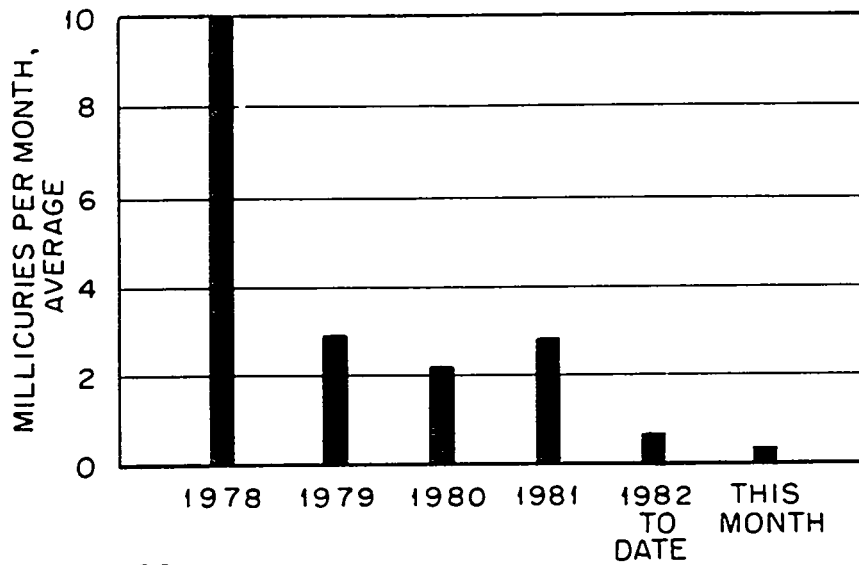


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

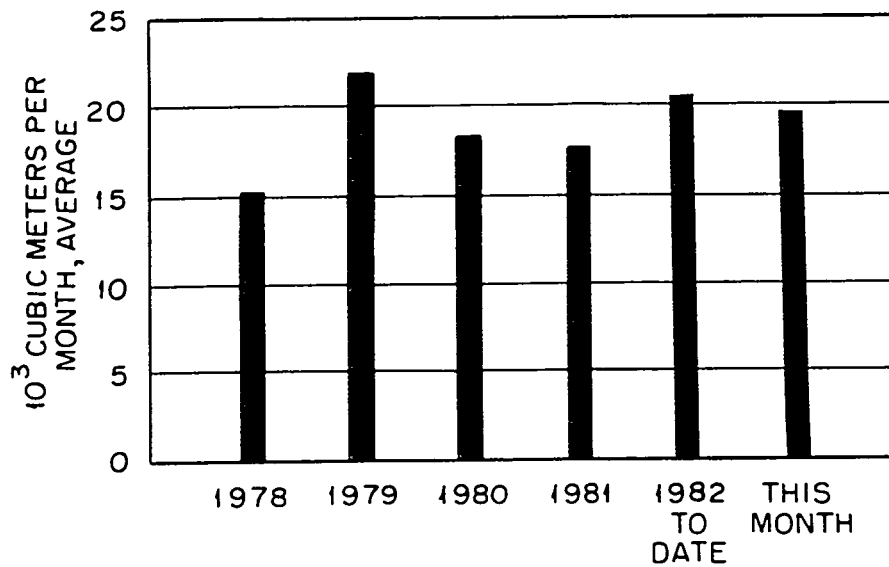


Fig. 4. Process Waste Volumes.

ORNL-DWG 79-9405R3

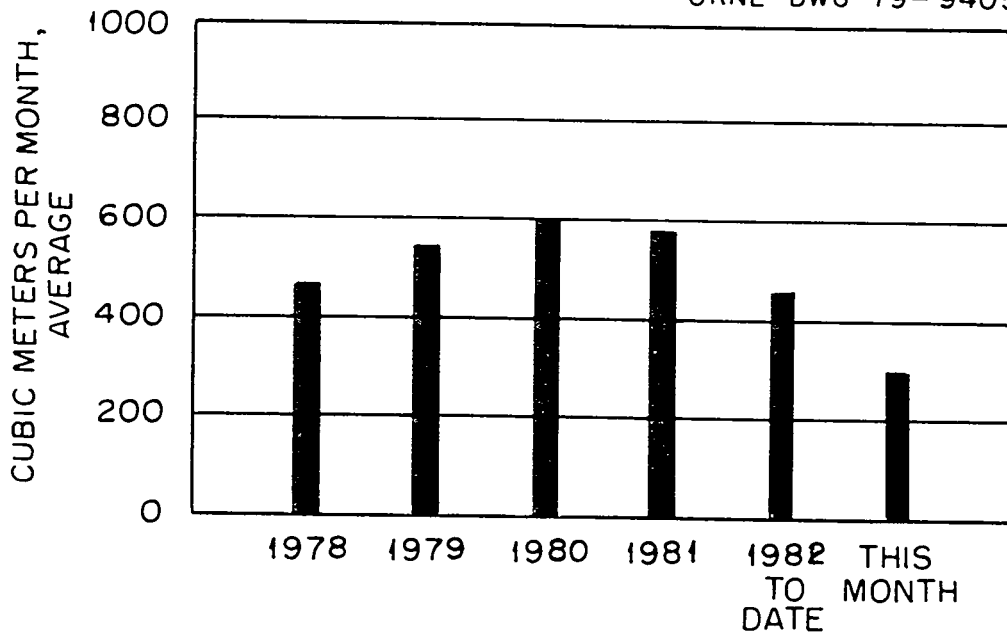


Fig. 5. Intermediate-Level Waste Volumes.

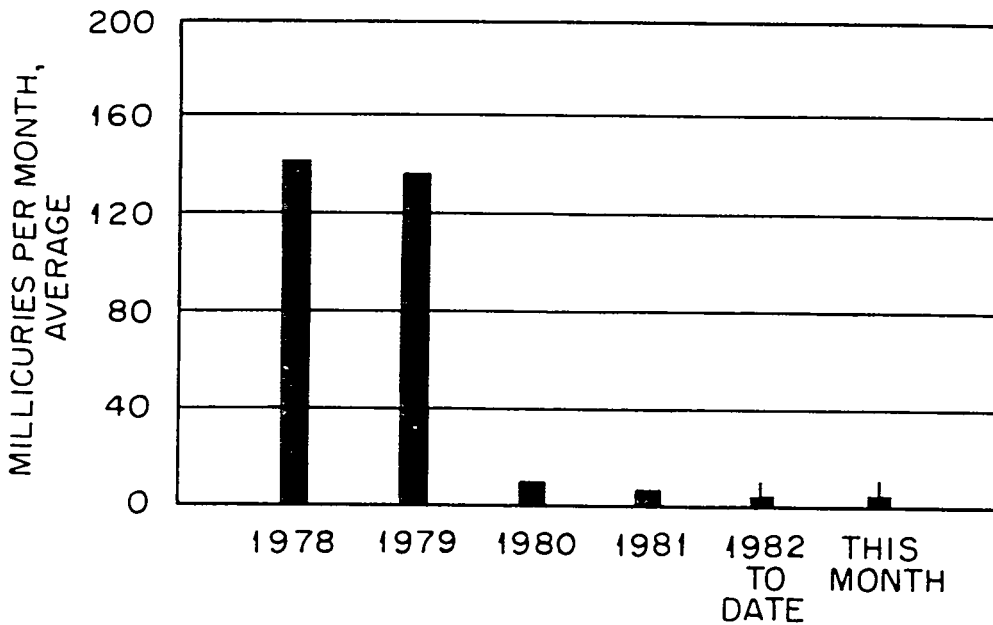


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

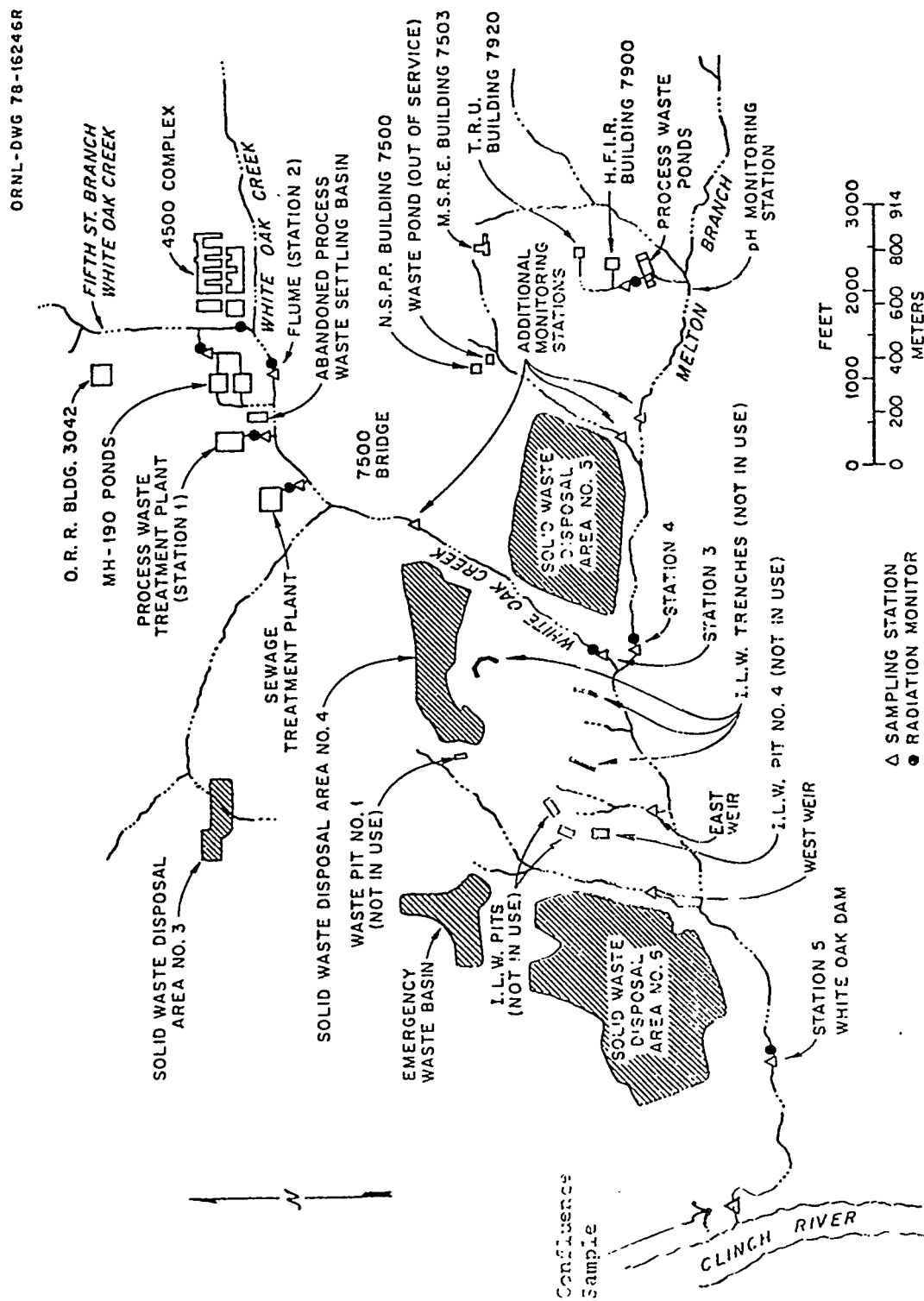


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.1792	0.3584
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0816	0.1632
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0024	-----
Total discharge from all sources		0.2633	0.5216
White Oak Dam to Clinch River (ISAHP Measurement)		0.2650	0.9810

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr pCi/l	⁹⁰ Sr			Volume	
		Curies	% of Total	10 ³ m ³	% of Total	
Radioisotopes Processing Area (MH234)	990	0.120	17.9	4.51		22.8
Radioisotopes Processing Area (MH114 minus MH112)	---	0.247	36.8	2.39		12.1
Reactor Operations (MH112)	59	0.003	0.4	2.09		10.6
Buildings 3503 and 3508	0.4	<0.001	---	1.03		5.2
Buildings 3025 and 3026	13	<0.001	---	1.24		6.3
Building 3019	15	<0.001	---	1.59		8.1
Waste Evaporator, Bldg. 2531	280	0.013	1.9	1.66		8.4
Building 3525	0.2	<0.001	---	1.06		5.4
Building 2026	3.4	<0.001	---	1.21		6.1
Tank Farm Drainage	3588	0.288	43.0	2.97		15.0

^aThe activity entered the process-waste system with leakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

16

Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL 2026	< 0.01	< 1
Central Radioactive Gas Disposal Facilities 3039	< 0.01	128
Radiochemical-Processing Pilot Plant 3020	< 0.01	89d
MSRE 7512	< 0.01	<1
HFIR and TRU 7911	< 0.01	7
Total Activity in Gases Released at X-10 Site	< 0.01	224
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	1 (³ H)	
Building 4508 Ventilation Discharges Room 136		3.08 x 10 ⁻³
Room 265		7.00 x 10 ⁻⁴
Building 5505 Discharges Glove Box		4.50 x 10 ⁻³
Hood		1.16 x 10 ⁻¹

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.^dThis figure is higher than usual due to a filter change in the off-gas system of the analytical laboratory at Building 3019.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-82/229

DATE: July 16, 1982

SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent
Monitoring Report for the Month of May 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hammon 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of May was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 95.9 mCi. Drainage from the burial grounds, contaminated flood plains, and the dormant pit disposal area accounted for 59 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 120 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 3 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of May 1982 and 0.9% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 17.8% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.120 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 50 and 10^4 and 8×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 55.6 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.4 mCi of ^{90}Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ^{90}Sr was released from the 190 pond system; and an additional 24.0 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	9.5	
190 Ponds	0.2	
Process Waste Treatment Plant	0.4	
Sewage Treatment Plant	24.0	
	<u>34.1</u>	
7500 Sampling Station	42.9	
Burial Grounds Nos. 1 and 3, and Flood Plains		8.8
Station No. 3	58.0	
Burial Ground No. 4		15.1

Melton Branch

7900 Area (HFIR and TRU)	0.3	
7500 Area (NSPP and MSRE)	3.7	
	<u>4.0</u>	
Station No. 4	36.8	
Burial Ground No. 5		32.8

ILW Pit Disposal Area

East Weir	0.1	
West Weir	1.0	
	<u>1.1</u>	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)	95.9	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		56.7
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		59.1

Process Waste

A total of 1.73×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 1.67×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as backwashing of filters.

A monthly comparison of the strontium activity released from the process waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
672	B	32	719
673	C	52.5	1,171
674	A	40.5	904
675	B	40.5	904
676	C	48	1,071
677	A	38	861
678	B	33	736
679	C	34.5	769
680	A	32.5	862
681	B	34	759
682	C	46	1,027
683	A	36.5	814
684	B	31	670
685	C	36.5	814
686	A	33	759
687	B	48.5	922
688	C	54	904
689	A	39.5	661
690	B	33	538
691	C	52	870
692	A	36.5	611

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.43 m /hr.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	287.4
Volume transferred to evaporators	307.6
South Tank Farm Inventory:	
Beginning of Period	759.4
End of Period	783.4*
Service Tank Inventory:	
W-21, Beginning of Month	50.4
W-21, End of Month	23.3
W-22, Beginning of Month	19.5
W-22, End of Month	26.4
W-23, Beginning of Month	70.3
W-23, End of Month	91.5
Melton Valley Waste Storage Facility Inventory:	
Total volume at beginning of month	867.5
Total volume at end of month	869.8

* Increase due to preoperational testing of Gunite Tank Sludge Removal Facility.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Building 3019	15.7
Building 3525	9.8
Radioisotopes Processing Area	48.7
ORR and BSR	64.3
High Flux Isotope Reactor	36.4
Fission Products Development Laboratory	19.9*
4500 Complex	31.9
Building 3544	22.9
Transuranium Processing Area	3.8

Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than $193 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.0% and 0.3% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

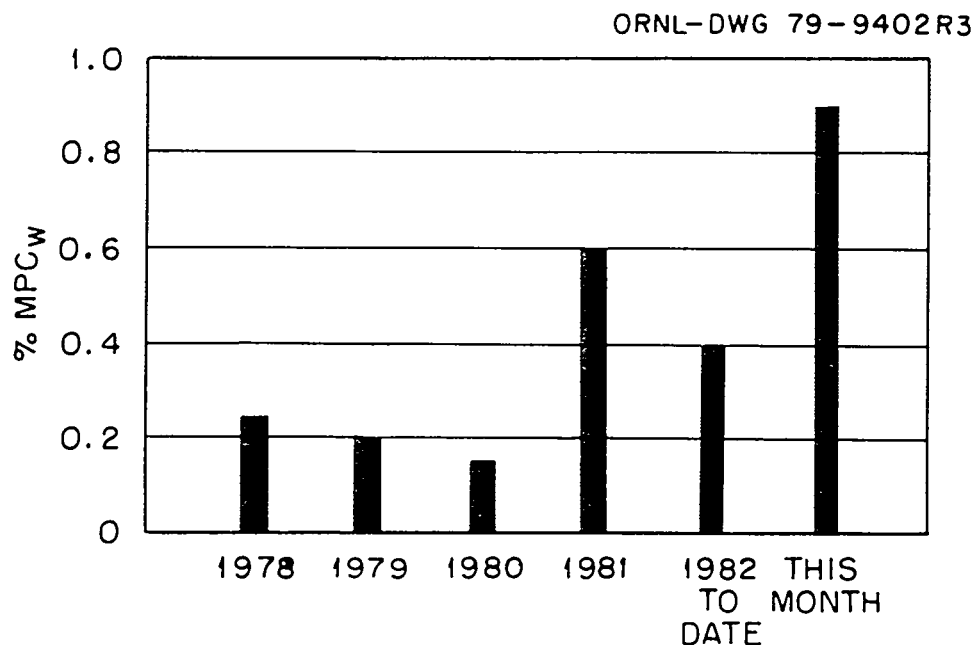


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

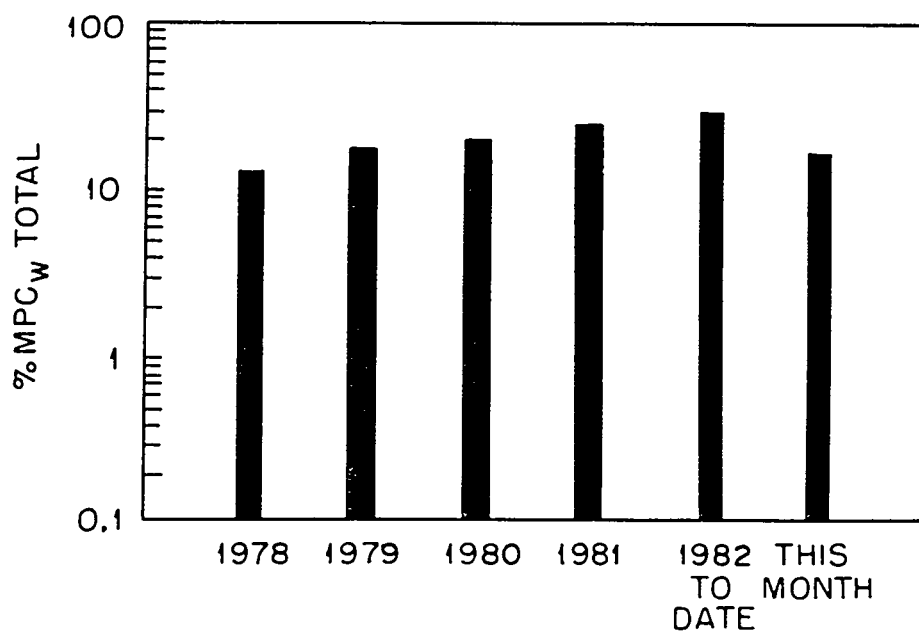


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

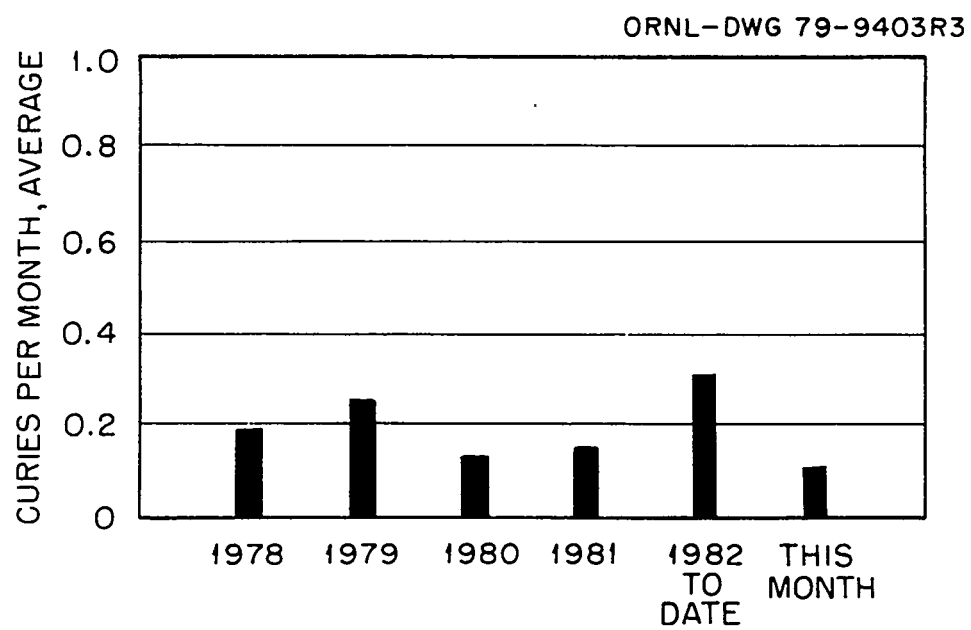


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7).

ORNL-DWG 79-9404R3

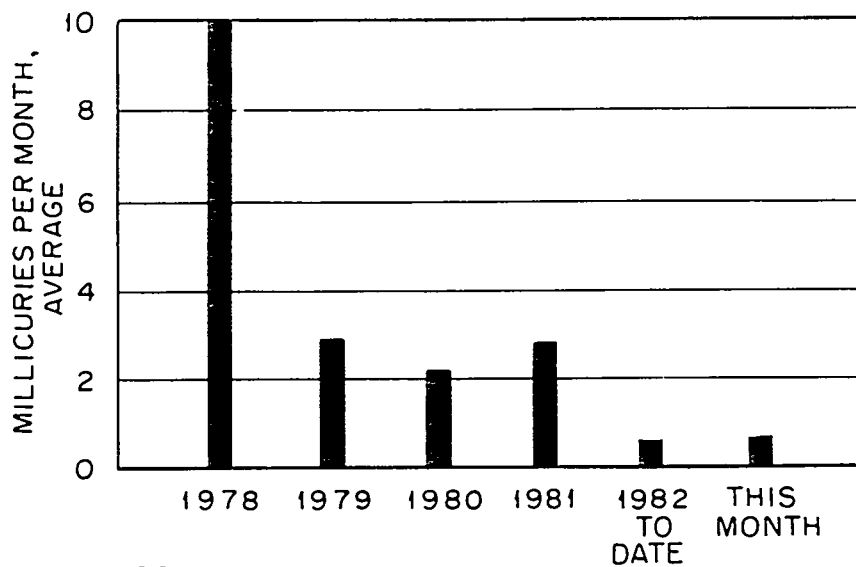


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

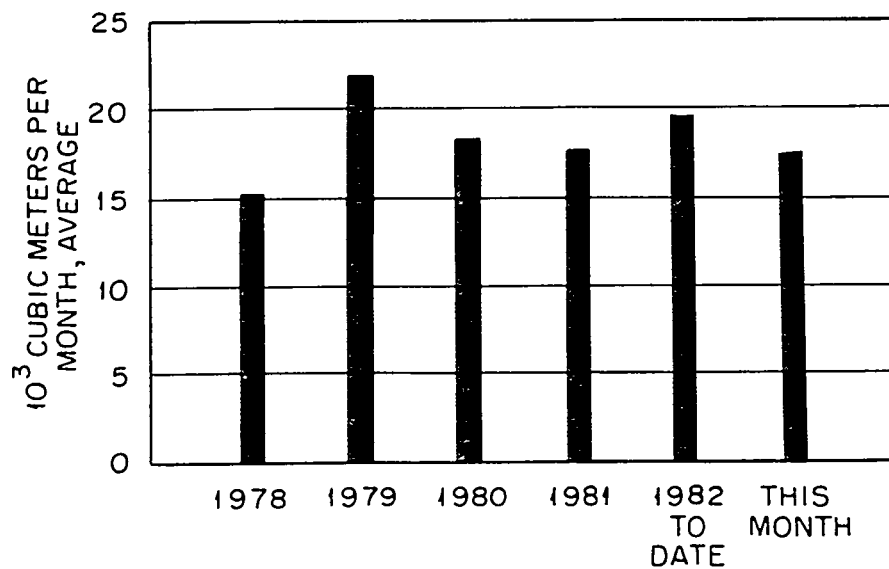


Fig. 4. Process Waste Volumes.

ORNL-DWG 79-9405R3

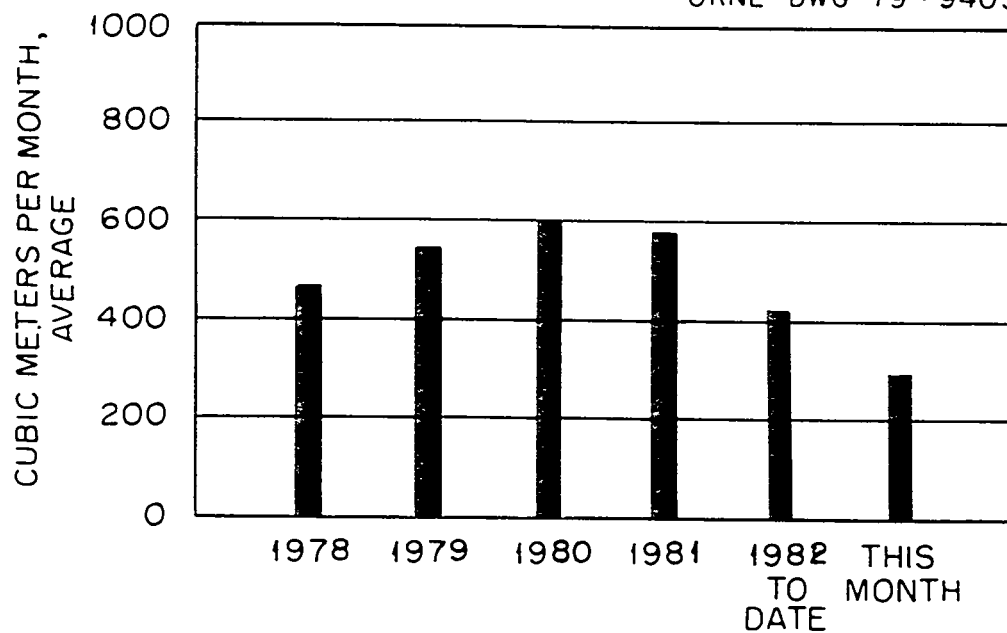


Fig. 5. Intermediate-Level Waste Volumes.

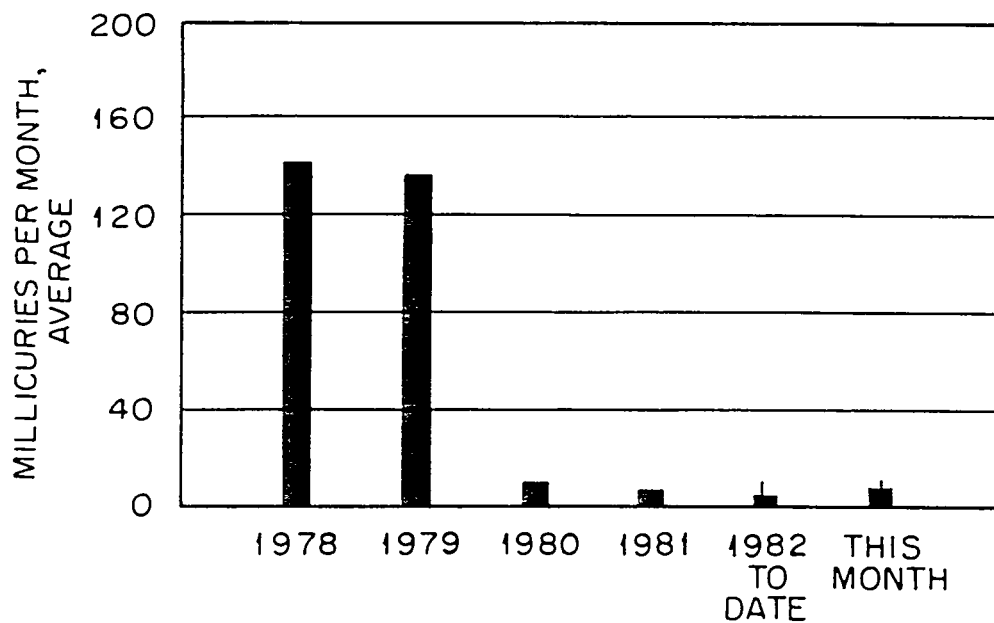


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

ORNL-DWG 78-16246R

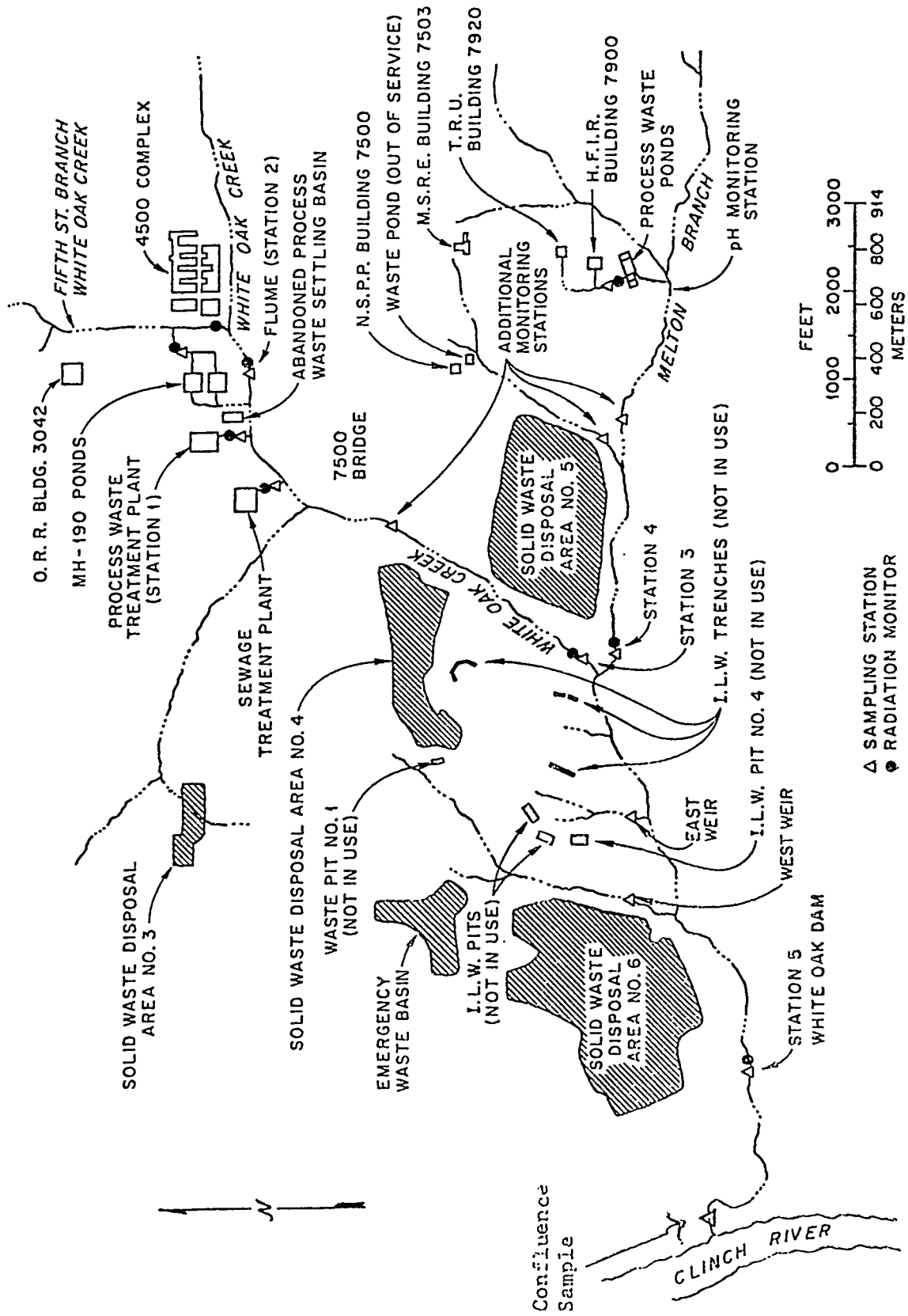


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0580	0.256
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0368	0.128
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0011	-----
Total discharge from all sources		0.0959	0.384
White Oak Dam to Clinch River (ISAHP Measurement)		0.1200	0.370

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr pCi/l	⁹⁰ Sr			Volume	
		Curies	% of Total	10 ³ m ³	% of Total	
Radioisotopes Processing Area (MH234)	1100	0.121	19.6	4.08		21.2
Radioisotopes Processing Area (MH114 minus MH112)	----	0.255	41.4	2.11		10.9
Reactor Operations (MH112)	23	0.002	0.3	2.91		15.1
Buildings 3503 and 3508	0.6	<0.001	----	0.48		2.5
Buildings 3025 and 3026	5.5	<0.001	----	1.25		6.5
Building 3019	7.4	<0.001	----	1.53		7.9
Waste Evaporator, Bldg. 2531	680	0.037	6.0	1.99		10.3
Building 3525	22	<0.001	----	0.87		4.5
Building 2026	2	<0.001	----	1.08		5.6
Tank Farm Drainage	2500	0.201	32.7	2.98		15.5

^aThe activity entered the process-waste system with leakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL	< 0.01	2
Central Radioactive Gas Disposal Facilities	< 0.01	51
Radiochemical-Processing Pilot Plant	< 0.01	89
MSRE	< 0.01	<1
HFIR and TRU	< 0.01	51
Total Activity in Gases Released at X-10 Site	< 0.01	193
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	10 (³ H)	
Building 4508 Ventilation Discharges Room 136		(c)
Room 265		7.00 x 10 ⁻⁴
Building 5505 Discharges Glove Box		4.50 x 10 ⁻³
Hood		7.75 x 10 ⁻²

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.

DATE ISSUED AUG 19 1982

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ORNL
CENTRAL FILES NUMBER

ORNL/CF 82/242

DATE: August 2, 1982

SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent
Monitoring Report for the Month of June 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

[Signature] 7/5/86
Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of June was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 77.4 mCi; drainage from the burial grounds, contaminated flood plains, and the dormant pit disposal area accounted for 52 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 93 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 9 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of June was 0.2 percent of the MPC_W (Fig 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 12.5% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.093 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 47×10^4 and 7×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 75.1 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 24.3 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	8.0	
190 Ponds	0.2	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>24.3</u>	
	32.7	
7500 Sampling Station	44.2	
Burial Grounds Nos. 1 and 3, and Flood Plains		11.5
Station No. 3	49.8	
Burial Ground No. 4		5.6

Melton Branch

7900 Area (HFIR and TRU)	0.6	
7500 Area (NSPP and MSRE)	<u>1.8</u>	
	2.4	
Station No. 4	25.3	
Burial Ground No. 5		22.9

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>2.2</u>	
	2.3	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)	77.4	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		40.0
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		51.7

Process Waste

A total of 2.22×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 2.11×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as back-washing of filters.

A monthly comparison of the strontium activity released from the process waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
693	B	34.5	783
694	C	33.5	761
695	A	36	820
696	B	56.5	1064
697	C	85	1443
698	A	54.5	929
699	B	52	898
700	C	59.5	1187
701	A	44	750
702	B	46.5	791
703	C	64	1090
704	A	39	737
705	B	45.5	798
706	C	59	1006
707	A	45.5	775
708	B	41	699
709	C	37	631
710	A	45.5	775
711	B	37	629
712	C	32.5	554
713	A	23	391
714	B	25	481
715	C	37.5	638
716	A	50	856
717	B	37	631
718	C	40	682
719	A	32.5	536
720	B	46	843

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.53 m³/hr.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	386.3
Volume transferred to evaporators	381.3
South Tank Farm Inventory:	
Beginning of Month	783.4
End of Month	846.9
Service Tank Inventory:	
W-21, Beginning of Month	23.3
W-21, End of Month	19.5
W-22, Beginning of Month	26.4
W-22, End of Month	35.2
W-23, Beginning of Month	91.5
W-23, End of Month	119.9
Melton Valley Waste Storage Facility Inventory:	
Total volume at beginning of month	869.8
Total volume at end of month	312.1

The first ILW injection at the New Hydrofracture Facility was completed on June 16 and 17: A total of 158,000 gal of ILW containing 19,278 Ci of radioactivity was slurried in one million pounds of blended solids and pumped into a fracture at a depth of 1,096 ft below surface. The scope of the job dictated a pumping schedule of two 10-hour days.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Transuranium Processing Area	15.4
Building 3019	22.2
Building 3525	7.8
Radioisotopes Processing Area	69.2
ORR and BSR	95.6
High Flux Isotope Reactor	32.8
Fission Products Development Laboratory	16.6*
4500 Complex	24.4
Building 3544	35.7

Gaseous Waste

The ORNL Stacks discharged <8 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than $153 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.2% and 0.2% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

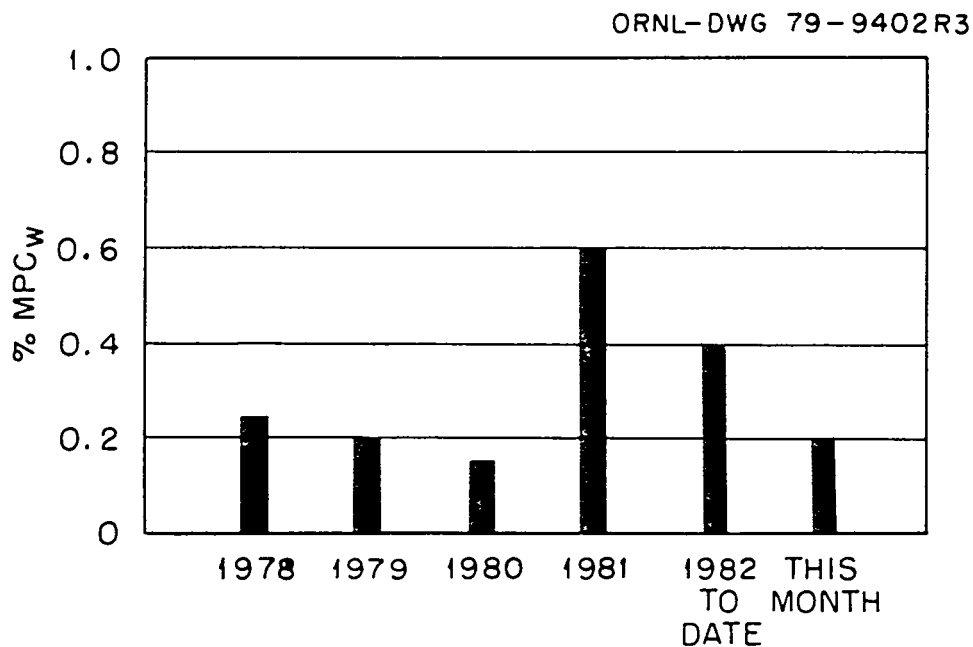


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

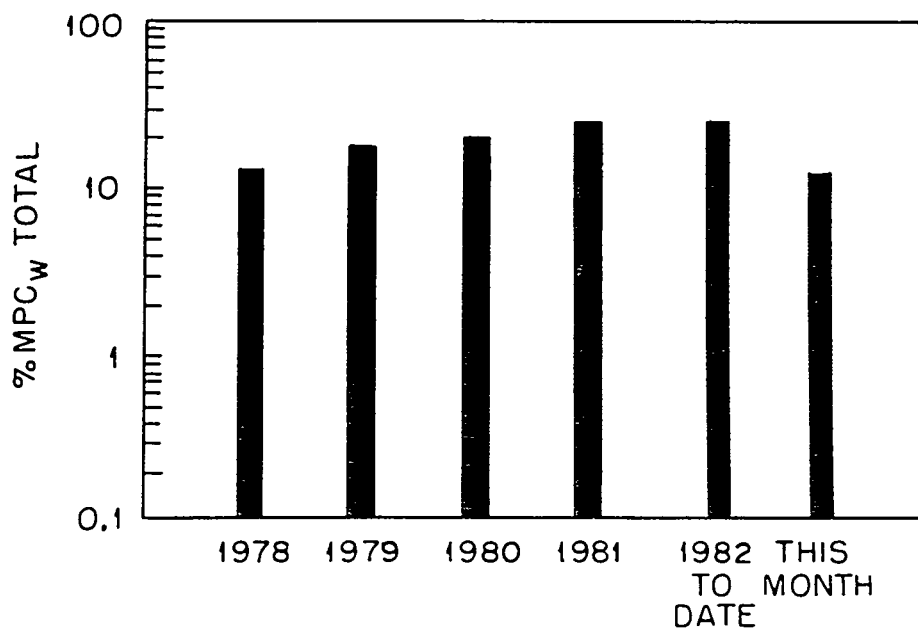


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

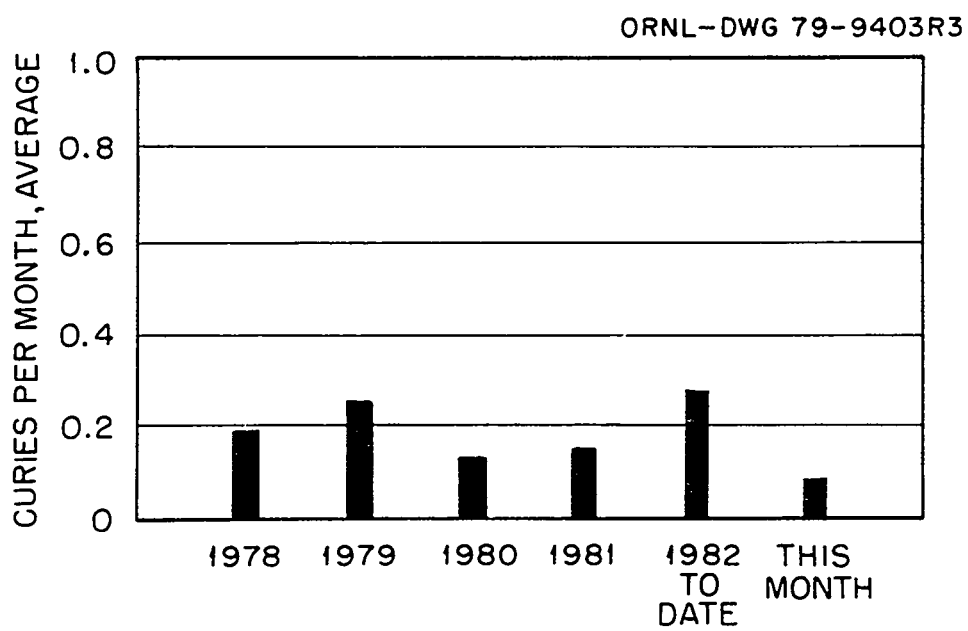


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 7).

ORNL-DWG 79-9404R3

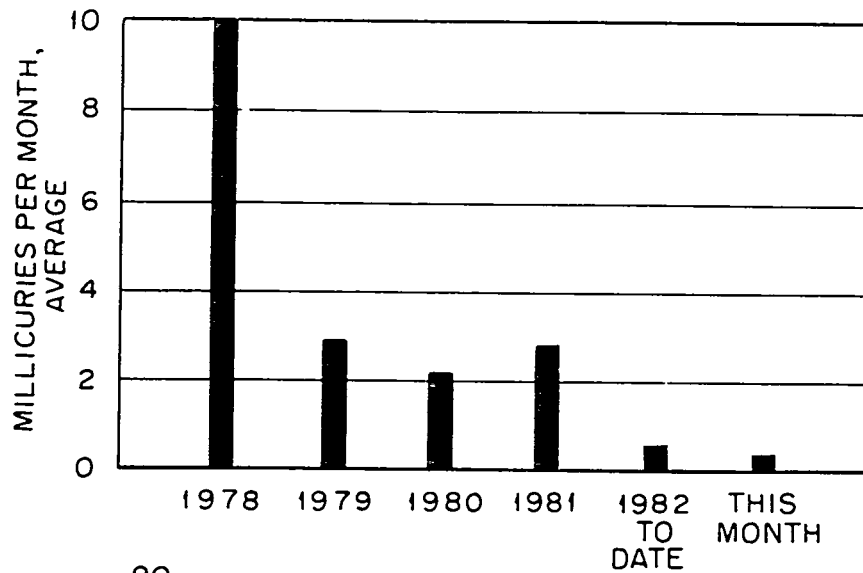


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

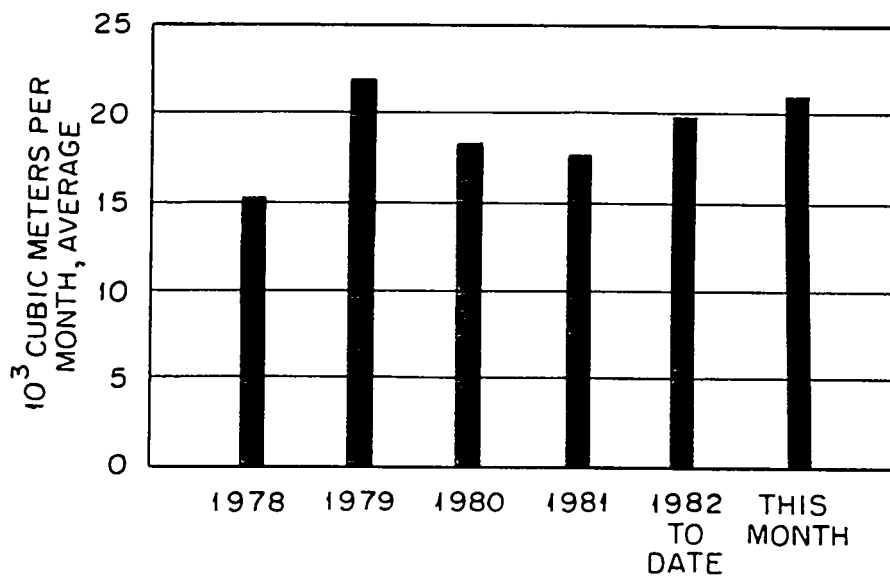


Fig. 4. Process Waste Volumes.

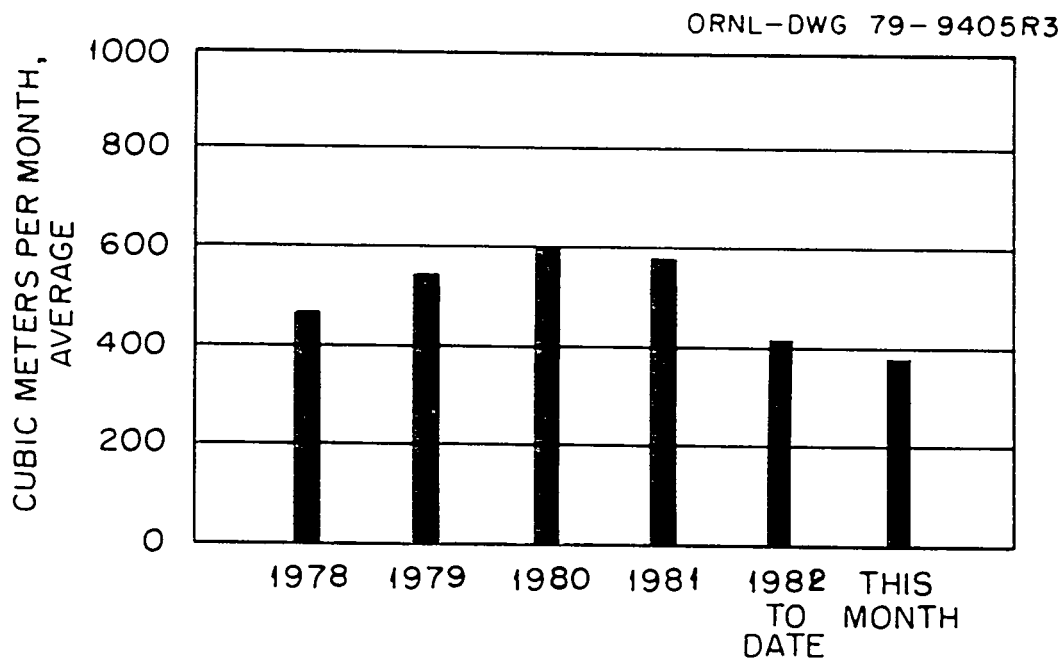


Fig. 5. Intermediate-Level Waste Volumes.

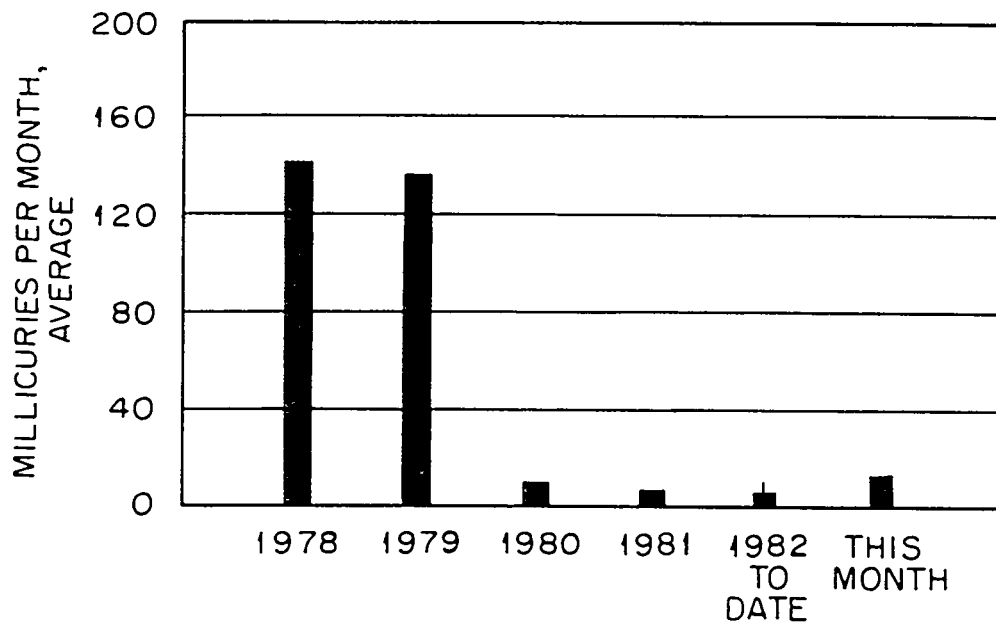


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

ORNL-DWG 78-16246R

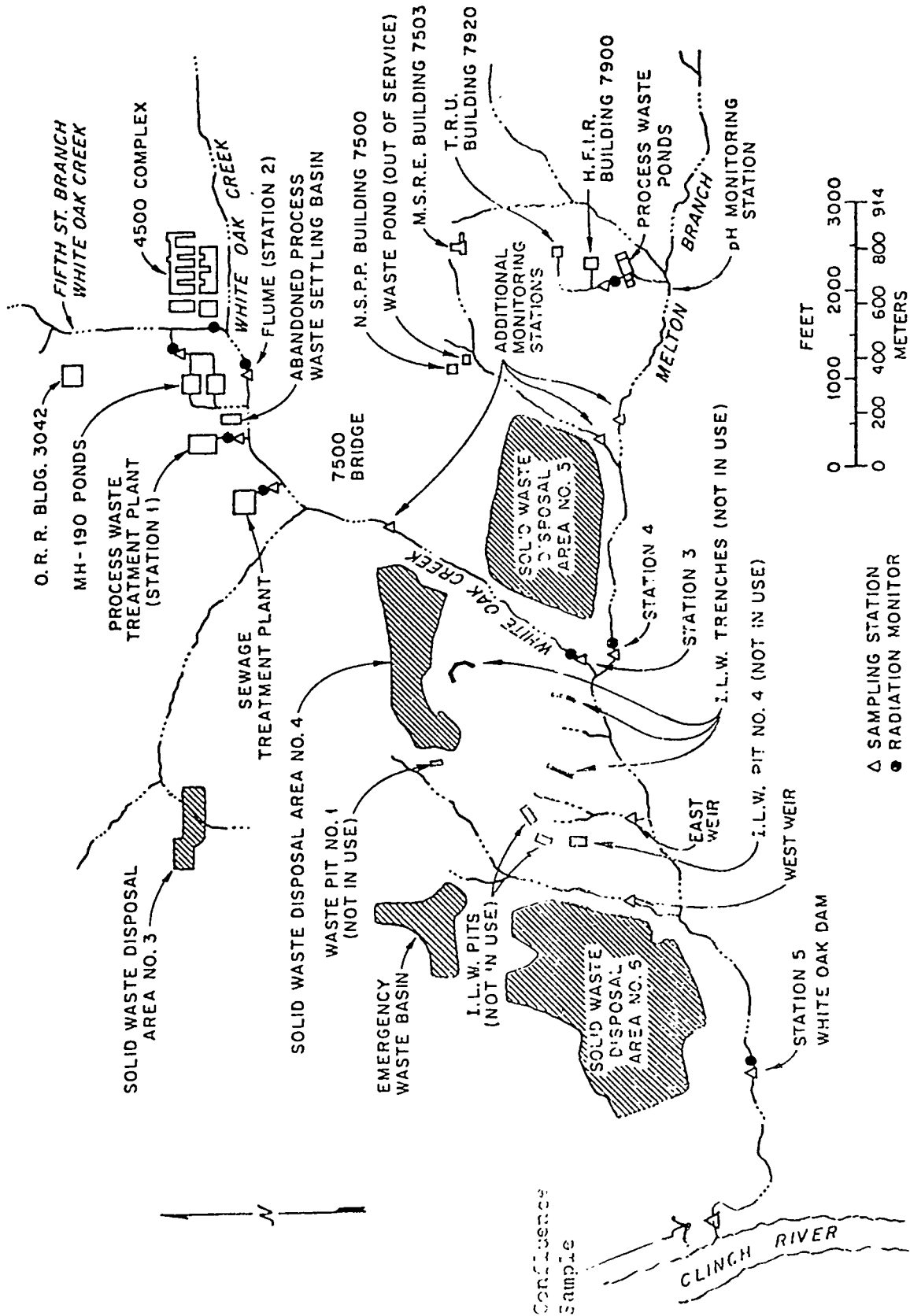


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0498	0.166
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0233	0.077
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0023	-----
Total discharge from all sources		0.0774	0.243
White Oak Dam to Clinch River (ISAHF Measurement)		0.0931	0.859

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr BQ/ℓ	⁹⁰ Sr			Volume	
		Curies	% of Total	10 ³ m ³	% pf Total	
Radioisotopes Processing Area (MH234)	1400	0.147	22.8	3.90		18.3
Radioisotopes Processing Area (MH114 minus MH112)	---	0.227	35.1	0.68		3.2
Reactor Operations (MH112)	98	0.009	1.4	3.48		16.3
Buildings 3503 and 3508	1.4	<0.001	---	0.82		3.9
Buildings 3025 and 3026	4.5	<0.001	---	1.62		7.6
Building 3019	3.6	<0.001	---	3.06		14.4
Waste Evaporator, Bldg. 2531	830	0.048	7.4	2.15		10.1
Building 3525	25	<0.001	---	0.72		3.4
Building 2026	0.9	<0.001	---	1.40		6.6
Tank Farm Drainage	2300	0.215	33.3	3.46		16.2

^aThe activity entered the process-waste system with inletage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL 2026	< 0.01	< 1
Central Radioactive Gas Disposal Facilities 3039	< 0.01	51
Radiochemical-Processing Pilot Plant 3020	< 0.01	63
MSRE 7512	< 0.01	< 1
HFIR and TRU 7911	< 0.01	39
Total Activity in Gases Released at X-10 Site	< 0.01	153
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	1 (³ H)	
Building 4508 Ventilation Discharges Room 136		(c)
Room 265		7.00 x 10 ⁻⁴
Building 5505 Discharges Glove Box		4.50 x 10 ⁻³
Hood		7.75 x 10 ⁻²

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-82/272

DATE: September 13, 1982

SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent
Monitoring Report for the Month of July 1982

TO: Distribution

FROM: L. C. Lasher²⁷ and C. B. Scott²⁷

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

Dundeltown 7/15/86
Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of July was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 82 mCi; drainage from the burial grounds, contaminated flood plains, and the dormant pit disposal area accounted for 42 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 106 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 3 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of July was 0.1 percent of the MPC_W (Fig 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 9.0% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.106 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 53×10^4 and 8×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 79.4 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 16.4 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	9.9	
190 Ponds	0.2	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>16.4</u>	
	26.7	
7500 Sampling Station	48.4	
Burial Grounds Nos. 1 and 3, and Flood Plains		21.7
Station No. 3	50.1	1.7
Burial Ground No. 4		

Melton Branch

7900 Area (HFIR and TRU)	2.4	
7500 Area (NSPP and MSRE)	<u>6.0</u>	
	8.4	
Station No. 4	29.3	
Burial Ground No. 5		20.9

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>2.7</u>	
	2.8	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)		44.3
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains	82.2	
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		53.9

Process Waste

A total of 2.11×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 2.08×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as back-washing of filters.

A monthly comparison of the strontium activity released from the process waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

<u>ION EXCHANGE COLUMN OPERATION DATA</u>			
<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
721	C	62.5	1064
722	A	33.5	599
723	B	32	716
724	C	35	794
725	A	45.5	864
726	B	55.5	945
727	C	45	775
728	A	41	699
729	B	42	718
730	C	44	750
731	A	47	732
732	B	38.5	656
733	C	43	732
734	A	35	617
735	B	27	585
736	C	30	682
737	A	31.5	715
738	B	32	715
739	C	45	880
740	A	43.5	741
741	B	32.5	554
742	C	35.5	605

ION EXCHANGE COLUMN OPERATION DATA (cont'd)

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
743	A	31.5	587
744	B	31.5	715
745	C	48.5	871
746	A	43.5	741
747	B	36	722
748	C	45.5	880
749	A	23.5	463

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.57 m³/hr.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	438.6
Volume transferred to evaporators	426.2
South Tank Farm Inventory:	
Beginning of Month	846.9
End of Month	692.1
Service Tank Inventory:	
W-21, Beginning of Month	19.5
W-21, End of Month	27.4
W-22, Beginning of Month	35.2
W-22, End of Month	39.7
W-23, Beginning of Month	119.9
W-23, End of Month	141.3
Melton Valley Waste Storage Facility Inventory:	
Total volume at beginning of month	312.1
Total volume at end of month	972.4

The Gunitite Tank Sludge Removal Facility was certified for operation during the period, and the cleanout of tank W-5 began on July 12. A total of 672 m³ of sludge/bentonite slurry have been transferred to the New Hydrofracture Facility for deep well disposal. The disposal operation is scheduled for completion during the week ending August 15.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Transuranium Processing Area	4.7
Building 3019	7.4
Building 3525	10.4
Radioisotopes Processing Area	44.6
ORR and BSR	63.6
High Flux Isotope Reactor	62.2
Fission Products Development Laboratory	2.8*
4500 Complex	37.5
Building 3544	39.1

Gaseous Waste

The ORNL Stacks discharged <2 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than $481 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.1% and 0.3% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

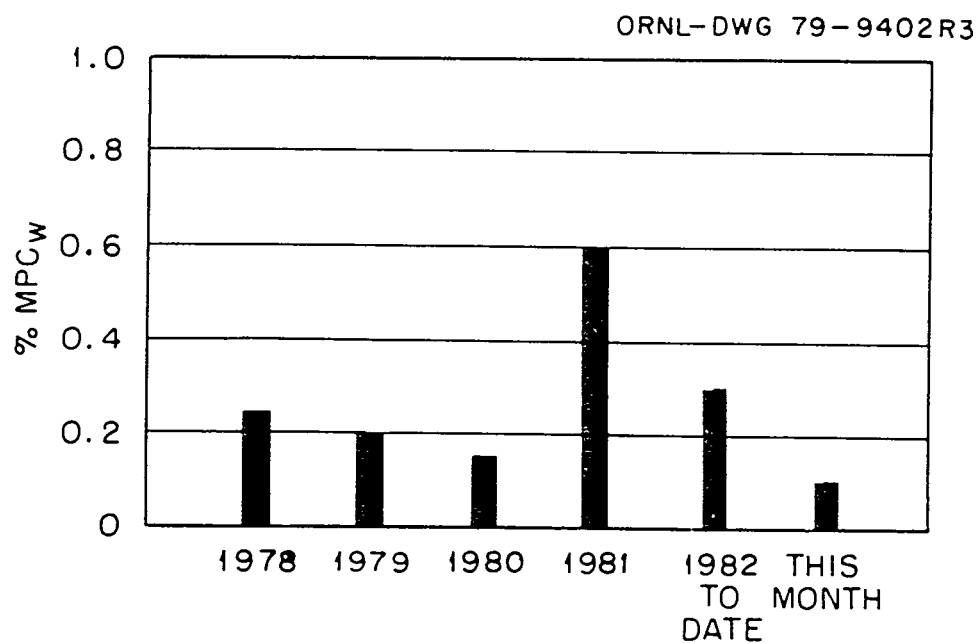


Fig. 1A. Calculated Percent of MPC_W in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

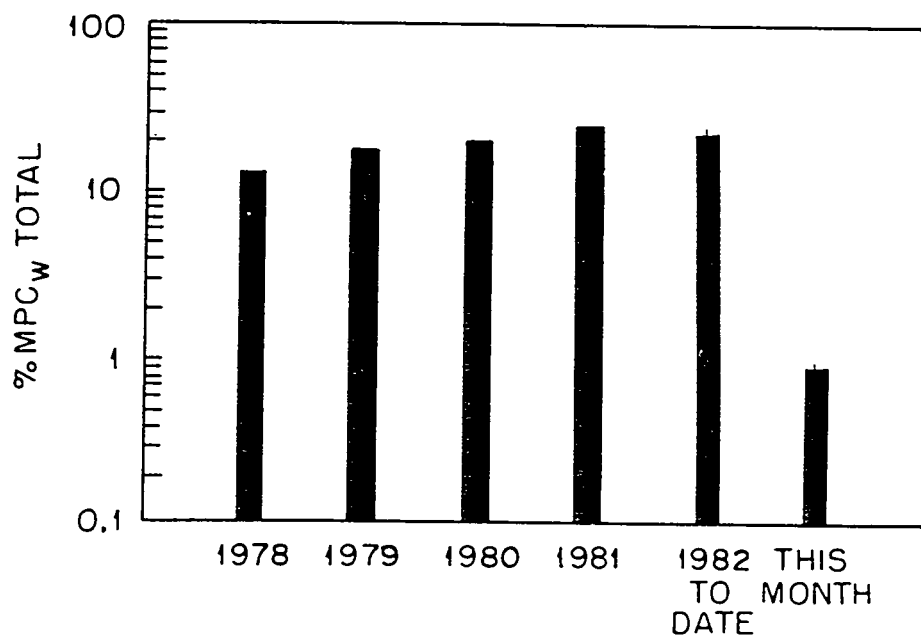


Fig. 1B. Measured Percent of MPC_W in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

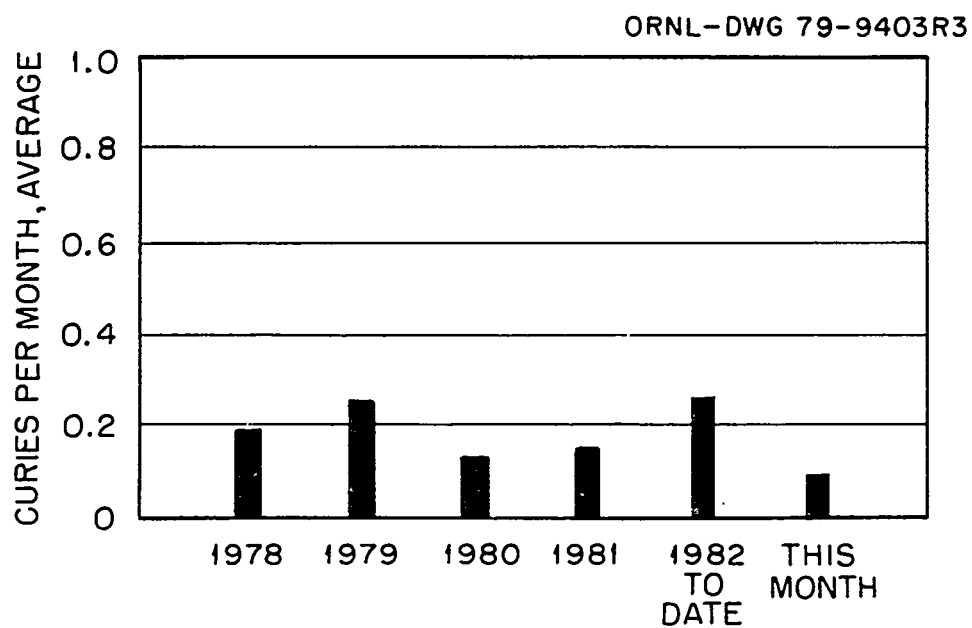


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 7).

ORNL-DWG 79-9404R3

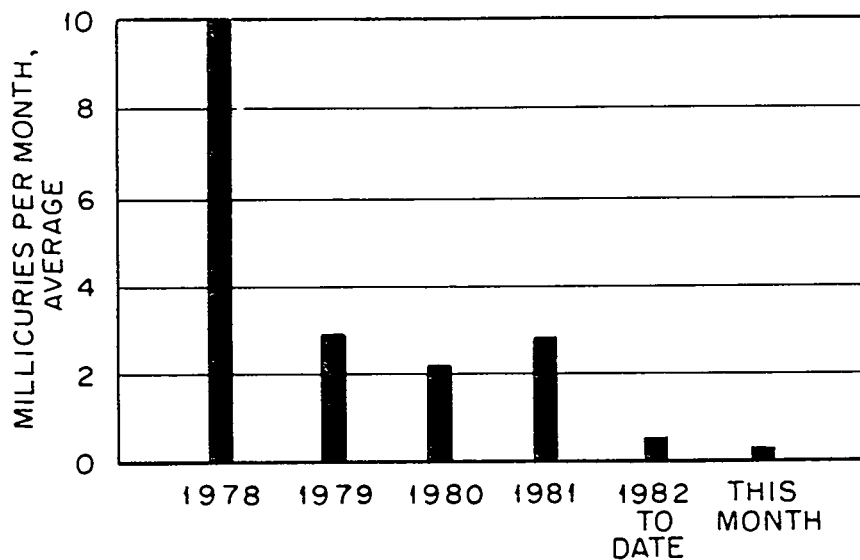


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

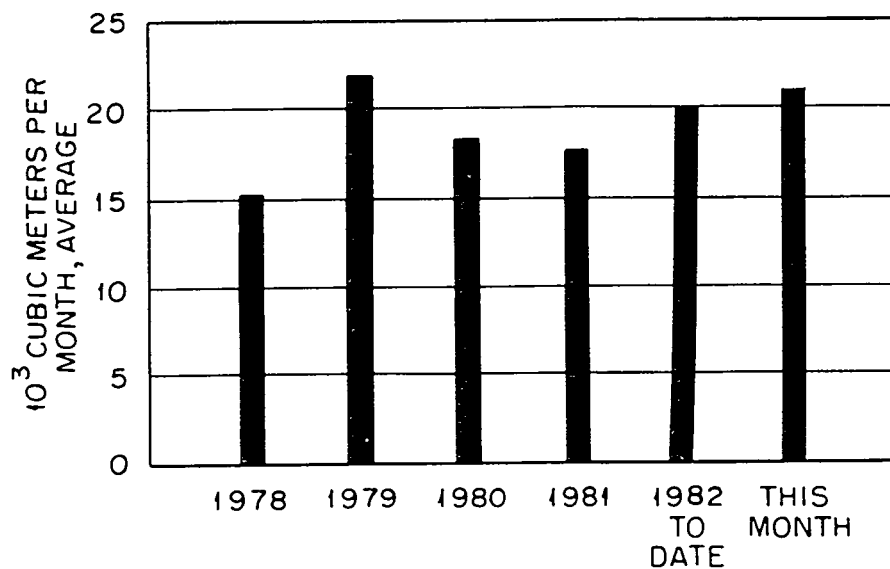


Fig. 4. Process Waste Volumes.

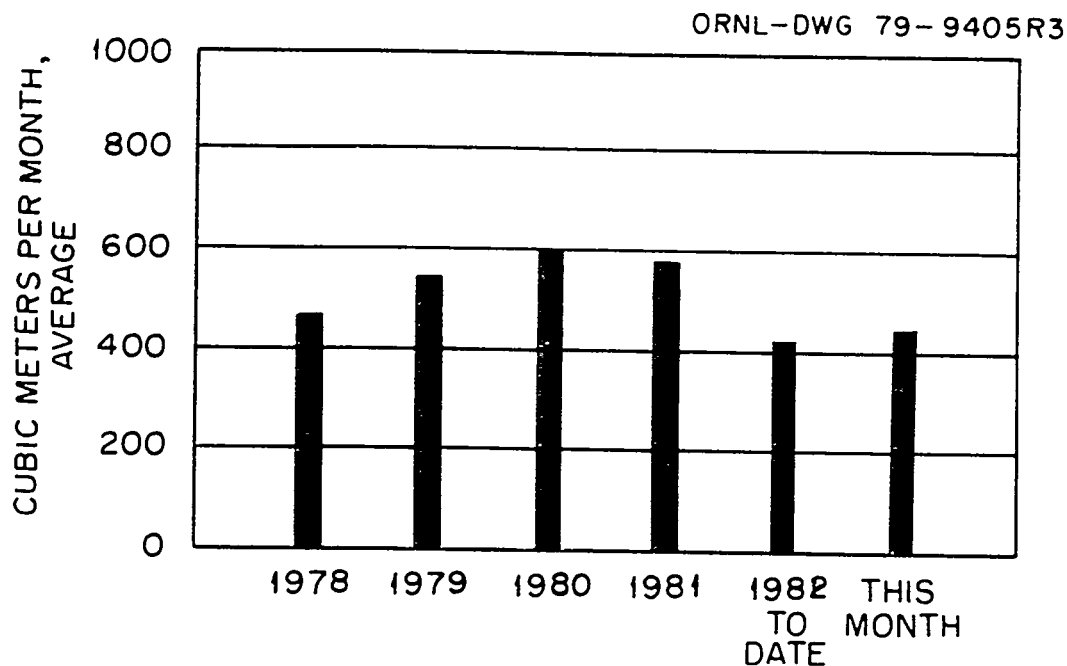


Fig. 5. Intermediate-Level Waste Volumes.

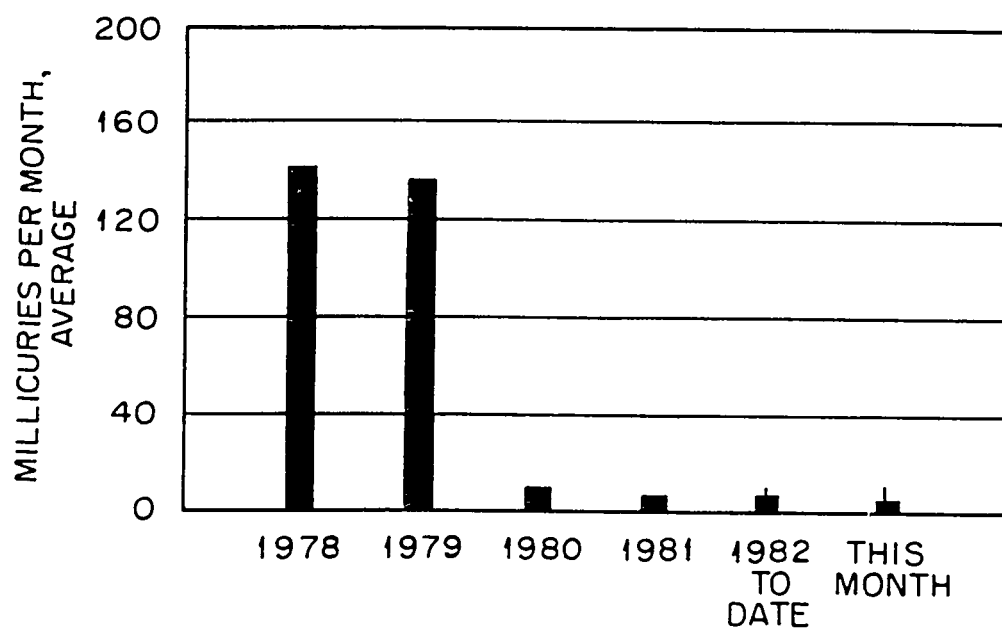


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

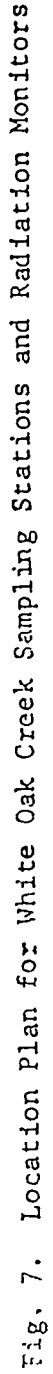


Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0501	0.128
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0293	0.043
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0027	-----
Total discharge from all sources		0.0821	0.171
White Oak Dam to Clinch River (ISAHP Measurement)		0.106	0.937

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr $\mu\text{g } \ell$	^{90}Sr			Volume	
		Curies	% of Total	10^3 m^3	% of Total	
Radioisotopes Processing Area (MH234)	820	0.109	16.0	4.92		21.5
Radioisotopes Processing Area (MH114 minus MH112)	---	0.243	35.6	0.77		3.4
Reactor Operations (MH112)	47	0.005	0.7	4.07		17.8
Buildings 3503 and 3508 (MH 229)	1.0	<0.001	---	1.05		4.6
Buildings 3025 and 3026 (MH 149)	3.7	<0.001	---	1.77		7.7
Building 3019 (MH 25)	8.7	<0.001	---	2.09		9.1
Waste Evaporator, Bldg. 2531 (MH 243)	1500	0.086	12.6	2.13		9.3
Building 3525 (MH 235)	7.8	<0.001	---	0.90		3.9
Building 2026 (MH 240)	1.3	<0.001	---	1.63		7.1
Tank Farm Drainage	2500	0.239	35.1	3.54		15.6

^aThe activity entered the process-waste system with inleakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL	2026	< 0.01	4
Central Radioactive Gas Disposal Facilities	3039	< 0.01	432
Radiochemical-Processing Pilot Plant	3020	< 0.01	19
MSRE	7512	< 0.01	< 1
HFIR and TRU	7911	< 0.01	26
Total Activity in Gases Released at X-10 Site		< 0.01	481
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		6 (³ H)	
Building 4508 Ventilation Discharges Room 136			(c)
Room 265			3.50 x 10 ⁻⁴
Building 5505 Discharges Glove Box			2.25 x 10 ⁻³
Hood			3.88 x 10 ⁻²

^aActivity primarily ¹³¹I except as noted.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

DATE ISSUED

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-82/335

DATE: December 14, 1982

SUBJECT: Radioactive Liquid and Gaseous Waste Disposal Operations and
Effluent Monitoring Report for the Month of August 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hargis 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of August was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 169 mCi; drainage from the burial grounds, contaminated flood plains, and the dormant pit disposal area accounted for 73 percent of this total. The Industrial Safety and Applied Health Physics Division measured a 76 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of August was 0.1 percent of the MPC_W (Fig 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 8.8% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.076 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 97×10^4 and 9×10^4 cubic meters, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 166.7 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 19.0 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds Nos. 1, 3 and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	11.9	
190 Ponds	0.2	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	19.0	
	31.3	
7500 Sampling Station	108.2	
Burial Grounds Nos. 1 and 3, and Flood Plains		76.9
Station No. 3	143.7	
Burial Ground No. 4		35.5

Melton Branch

7900 Area (HFIR and TRU)	0.5	
7500 Area (NSPP and MSRE)	14.0	
	14.5	
Station No. 4	23.0	
Burial Ground No. 5		8.5

ILW Pit Disposal Area

East Weir	0.1	
West Weir	2.2	
	2.3	
Total ⁹⁰ Sr to White Oak Lake (Stations No. 3 and No. 4 plus Ground Disposal Area)	169.0	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		123.2
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Flood Plains		72.9

Process Waste

A total of 2.22×10^4 cubic meters of contaminated waste was chemically treated this month. Of this amount, 2.17×10^4 cubic meters were released to the Creek; the remainder was used for process operations such as backwashing of filters.

A monthly comparison of the strontium activity released from the process waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
750	B	32	727
751	C	38.5	718
752	A	38.5	737
753	B	39	664
754	C	33	809
755	A	26	443
756	B	22	463
757	C	30.5	692
758	A	31	704
759	B	44	806
760	C	52	885
761	A	43	702
762	B	32	613
763	C	39	681
764	A	33	562
765	B	33	585
766	C	45	766
767	A	40.5	690
768	B	36	613
769	C	44	773
770	A	37	638

ION EXCHANGE COLUMN OPERATION DATA (cont'd)

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
771	B	26.5	503
772	C	33	750
773	A	33	750
774	B	29.5	622
775	C	36.5	673
776	A	30	622
777	B	38	652
778	C	32.5	738
779	A	19	431
780	B	32.5	707

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.56 m³/hr.

Internal heating coil No. 7 of evaporator vessel 2A.2 developed a leak during the reporting period and was subsequently capped off. The quality investigation is reported in QIR No. Op-WM-QIR-4-1.

A summary of storage operations is given below:

	<u>Cubic Meters</u>
Total volume generated	417.6
Volume transferred to evaporators	423.3
South Tank Farm Inventory:	
Beginning of Month	703.1
End of Month	657.9
Service Tank Inventory:	
W-21, Beginning of Month	27.4
W-21, End of Month	40.9
W-22, Beginning of Month	39.7
W-22, End of Month	20.5
W-23, Beginning of Month	141.3
W-23, End of Month	71.3
Melton Valley Waste Storage Facility Inventory:	
Total volume at beginning of month	972.4
Total volume at end of month	922.6

The first injection of resuspended sludge from the Gunite Tanks (W-5) was performed between August 10 and August 15, 1982, at the New Hydrofracture Facility. Approximately 893 m³ of waste and water were injected.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>Cubic Meters</u>
Transuranium Processing Area	11.8
Building 3019	26.8
Building 3525	8.8
Radioisotopes Processing Area	51.6
ORR and BSR	31.8
High Flux Isotope Reactor	101.7
Fission Products Development Laboratory	20.0*
4500 Complex	30.4
Building 3544	24.1

Gaseous Waste

The ORNL Stacks discharged <2 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was less than $162 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.6% and 0.2% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

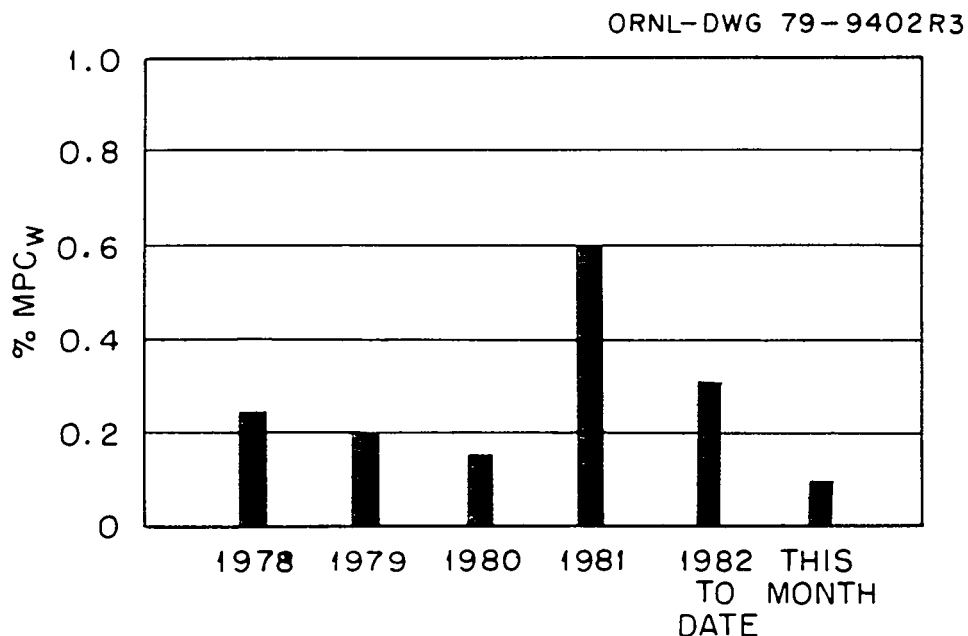


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

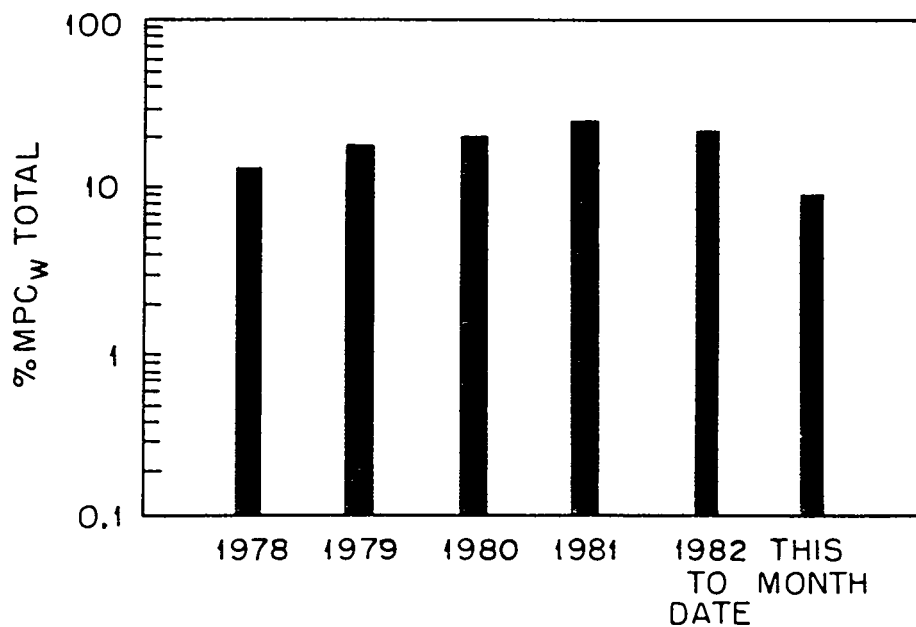


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

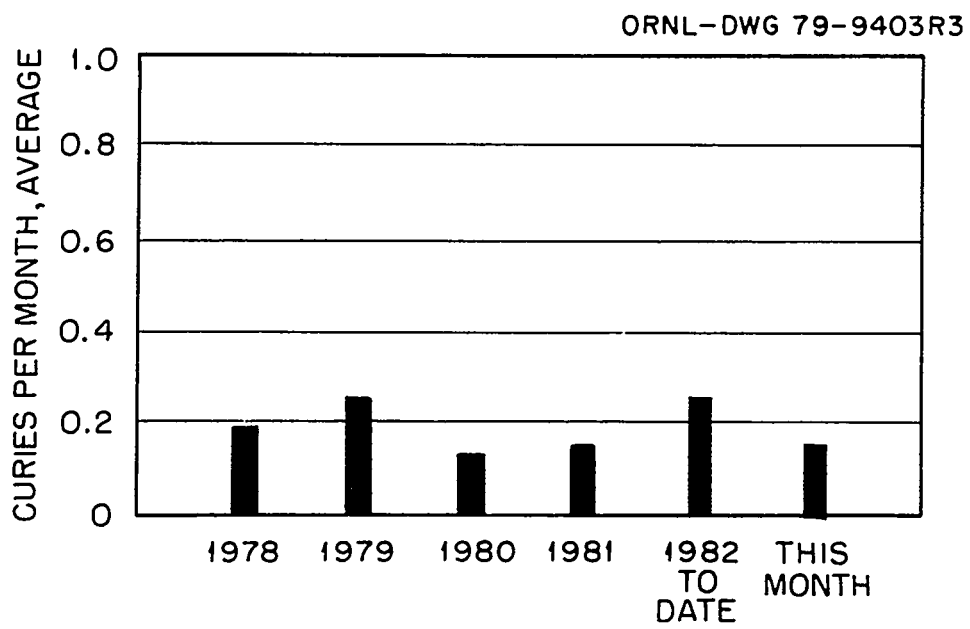


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 7).

ORNL-DWG 79-9404R3

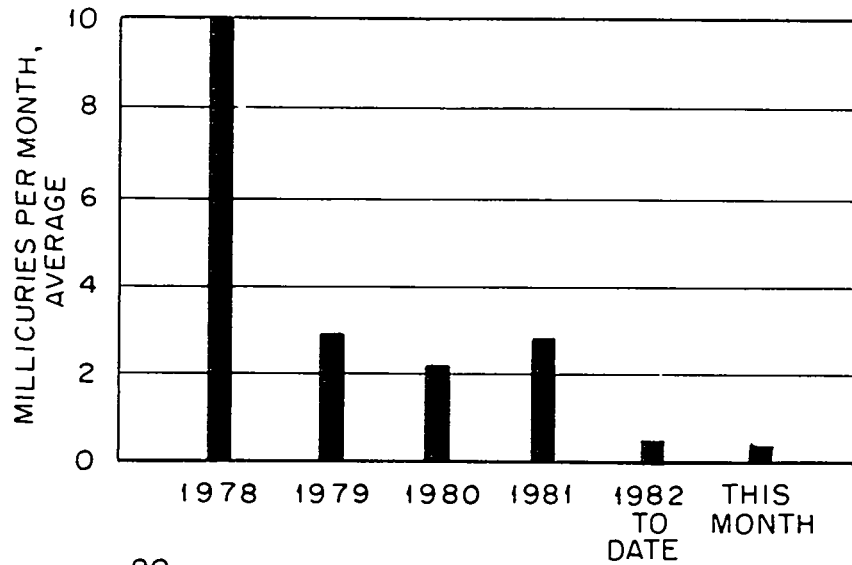


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

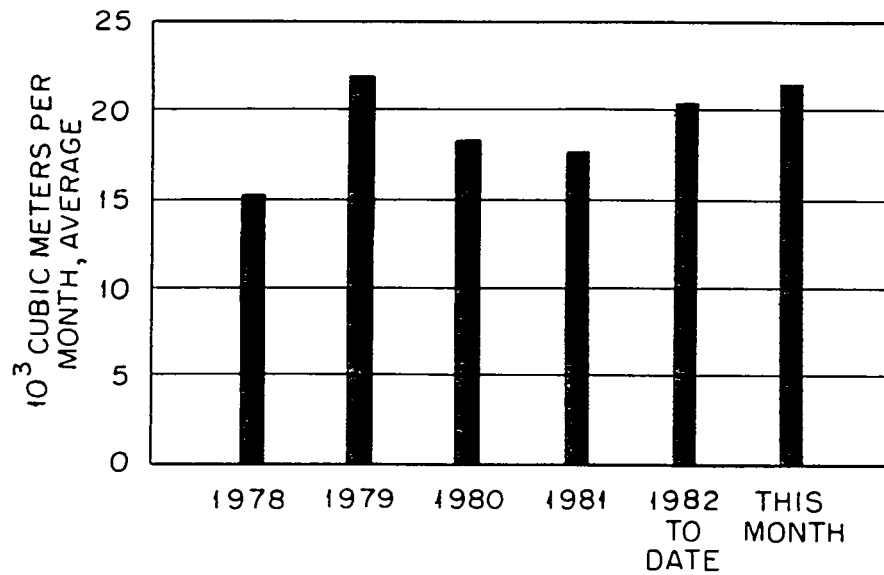


Fig. 4. Process Waste Volumes.

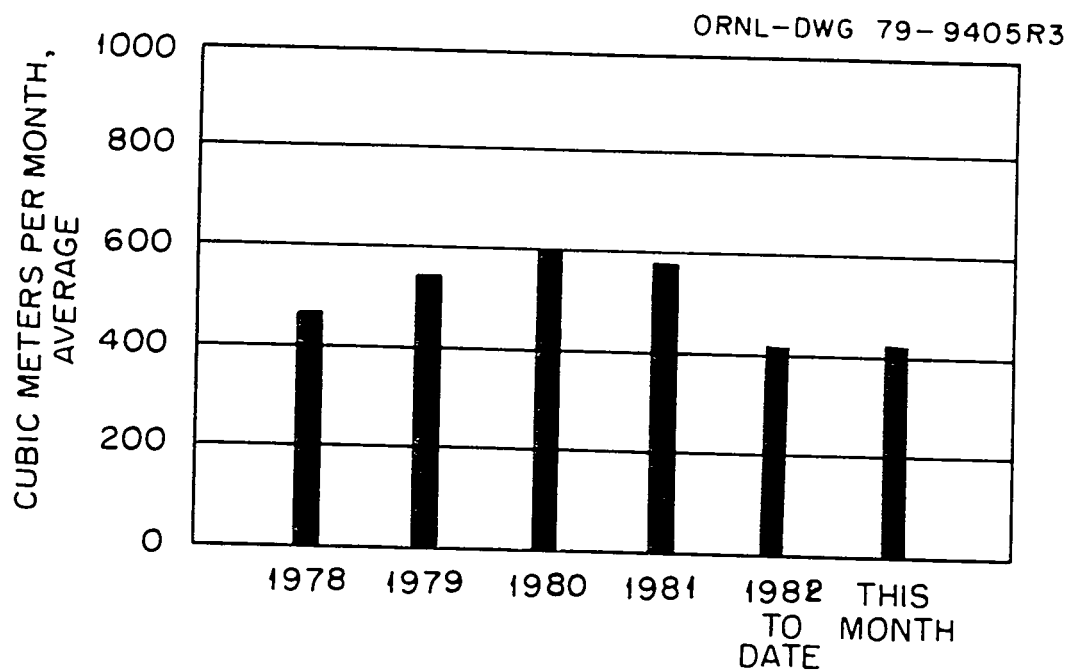


Fig. 5. Intermediate-Level Waste Volumes.

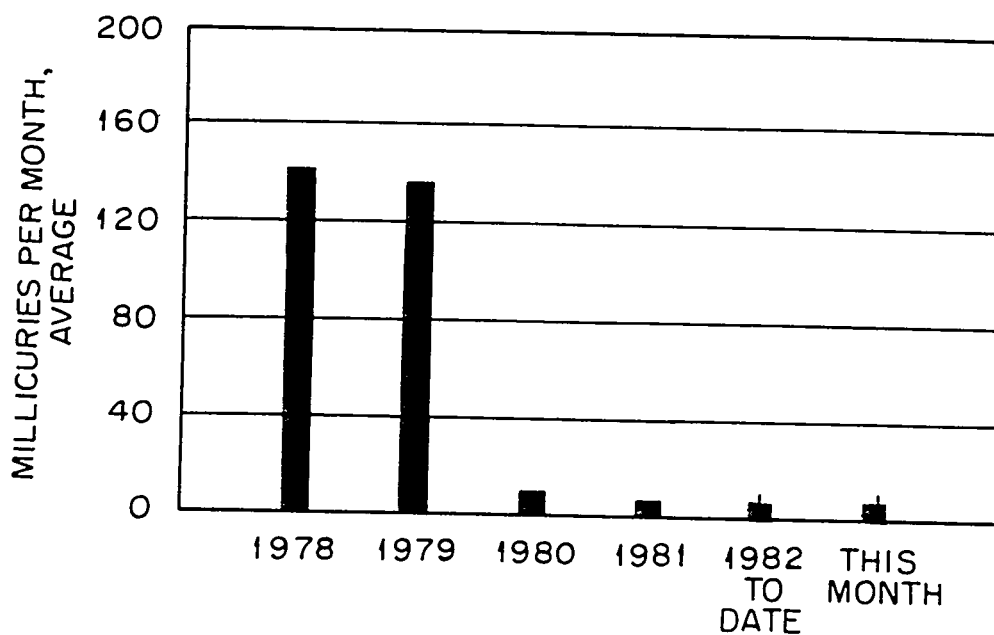


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

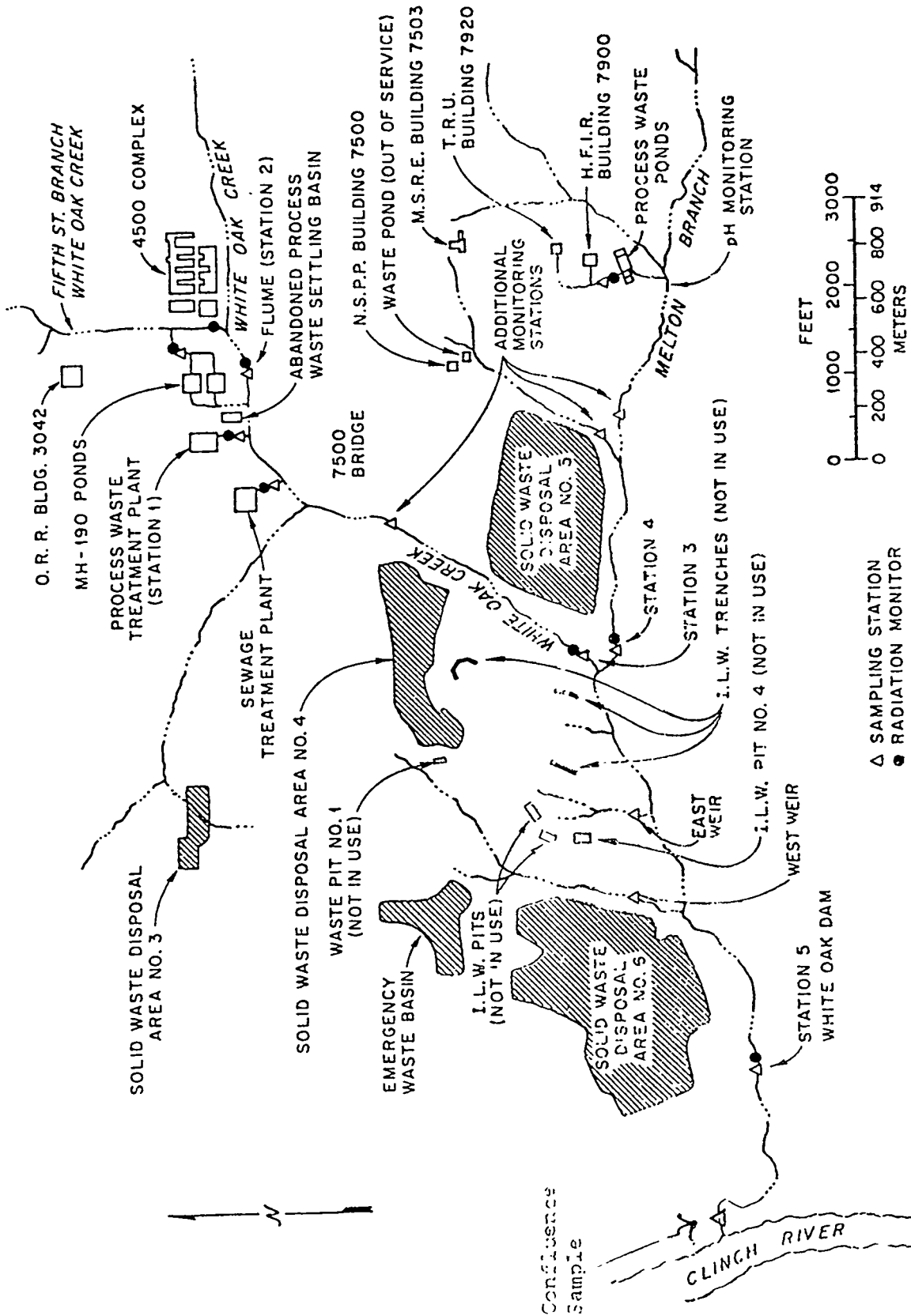


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Numbers	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.1437	0.287
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0230	0.055
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0022	-----
Total discharge from all sources		0.1690	0.342
White Oak Dam to Clinch River (ISAHP Measurement)		0.0755	0.320

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr Bq/l	⁹⁰ Sr			Volume	
		Curies	% of Total	10 ³ m ³	% of Total	
Radioisotopes Processing Area (MH234)	1500	0.119	13.0	4.67	18.2	
Radioisotopes Processing Area (MH114 minus MH112)	---	0.371a	40.6	1.04	4.1	
Reactor Operations (MH112)	43	0.006	0.7	5.61	21.8	
Buildings 3503 and 3508 (MH 229)	1.0	< 0.001	---	1.05	4.1	
Buildings 3025 and 3026 (MH 149)	20	< 0.001	---	1.31	5.1	
Building 3019 (MH 25)	19	< 0.001	0.1	2.66	10.4	
Waste Evaporator, Bldg. 2531 (MH 243)	1100	0.071	7.8	2.39	9.3	
Building 3525 (MH 235)	21	< 0.001	---	0.82	3.2	
Building 2026 (MH 240)	0.5	0.001	---	1.53	6.0	
Tank Farm Drainage	2800	0.346	37.8	4.57	17.8	

^aThe activity entered the process-waste system with leakage of contaminated ground water under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a (Curies)	Filterable Particulate Activity ^b (Microcuries)
HRLAL 2026	< 0.01	3
Central Radioactive Gas Disposal Facilities 3039	< 0.01	107
Radiochemical-Processing Pilot Plant 3020	< 0.01	16
MSRE 7512	< 0.01	9
HFIR and TRU 7911	< 0.01	27
Total Activity in Gases Released at X-10 Site	< 0.01	162
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	9 (³ H)	
Building 4508 Ventilation Discharges Room 136		6.7 x 10 ⁻²
Room 265		(c)
Building 5505 Discharges Glove Box		9.00 x 10 ⁻²
Hood		1.55

^aActivity primarily ¹³¹I except as noted.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-82/ 336

DATE: December 20, 1982

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND EFFLUENT
MONITORING REPORT FOR THE MONTH OF SEPTEMBER 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hann 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of September was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 91 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 63 % of this total. The Industrial Safety and Applied Health Physics Division measured a 94 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of October was 0.1 % of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 28.9% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.094 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 54×10^4 and 9×10^4 m³, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 89.5 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 13.1 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds Nos. 1, 3, and 4 (White Oak Creek) and Burial Ground No. 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 7).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	15.2	
190 Ponds	0.2	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>13.1</u>	
	28.7	
7500 Sampling Station	58.7	
Burial Grounds 1 and 3, and Floodplains		30.0
Station 3	68.5	
Burial Ground 4		9.8

Melton Branch

7900 Area (HFIR and TRU)	0.2	
7500 Area (NSPP and MSRE)	<u>5.0</u>	
	5.2	
Station 4	21.0	
Burial Ground 5		15.8

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>1.5</u>	
	1.6	
Total ⁹⁰ Sr to White Oak Lake Stations 3 and 4 plus Ground Disposal Area	91.1	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		57.2
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		63.0

Process Waste

A total of $2.18 \times 10^4 \text{ m}^3$ of contaminated waste was chemically treated this month. Of this amount, $2.10 \times 10^4 \text{ m}^3$ were released to the Creek; the remainder was used for process operations such as back-washing of filters.

A monthly comparison of the strontium activity released from the process waste system to White Oak Creek is shown in Fig. 3. The main contributors to the system are listed in Table 2. A brief summary of column operations follows:

ION EXCHANGE COLUMN OPERATION DATA

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
781	C	49	885
782	A	42	715
783	B	32	633
784	C	39.5	494
785	A	36.5	622
786	B	26	443
787	C	34	617
788	A	37	757
789	B	27.5	624
790	C	47	826
791	A	44	750
792	B	39.5	697
793	C	46	783
794	A	37.5	638
795	B	35	596
796	C	43	732
797	A	40	682
798	B	34	580
799	C	42.5	724
800	A	33.5	724

ION EXCHANGE COLUMN OPERATION DATA (cont'd)

<u>Run No.</u>	<u>Column</u>	<u>Run Time, Hours</u>	<u>m³ Treated</u>
801	B	32.5	638
802	C	32	480
803	A	32	727
804	B	33	750
805	C	33	750
806	A	34.5	585
807	B	25.5	435
808	C	29.5	670
809	A	30	682
810	B	35	692
811	C	43.5	737
812	A	33.5	656
813	B	25	568

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was $0.49 \text{ m}^3/\text{hr}$.

The summary of storage operations is given below:

	<u>m^3</u>
Total Volume Generated	330.2
Volume Transferred to Evaporators	319.2
South Tank Farm Inventory:	
Beginning of Month	657.9
End of Month	823.8
Service Tank Inventory:	
W-21, Beginning of Month	40.9
W-21, End of Month	31.8
W-22, Beginning of Month	20.5
W-22, End of Month	18.6
W-23, Beginning of Month	71.3
W-23, End of Month	92.7
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	922.6
Total Volume at End of Month	764.3

The second injection of resuspended sludge from the gunite tanks (W-5) was performed on September 23 and September 24, 1982. Approximately 439 m^3 of resuspended sludge were injected.

A list of major contributors of intermediate level waste is given below. Figure 5 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	8.1
Building 3019	26.9
Building 3525	5.7
Radioisotopes Processing Area	42.6
ORR and BSR	82.1
High Flux Isotope Reactor	20.5
Fission Products Development Laboratory	8.2*
4500 Complex	45.2
Building 3544	30.7

Gaseous Waste

The ORNL Stacks discharged <2 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was less than 245 µCi. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.4% and 0.2% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 6.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

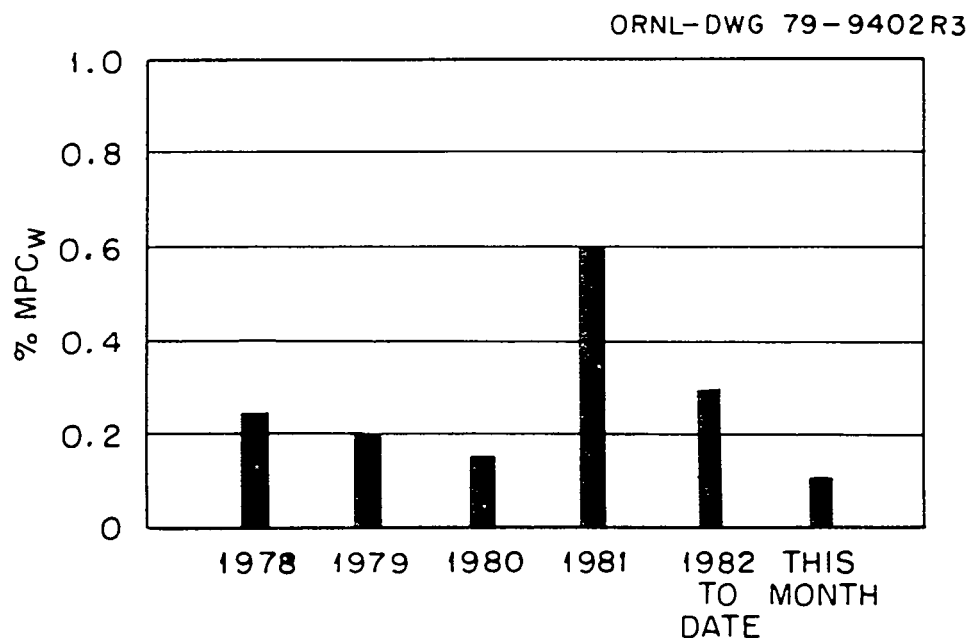


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

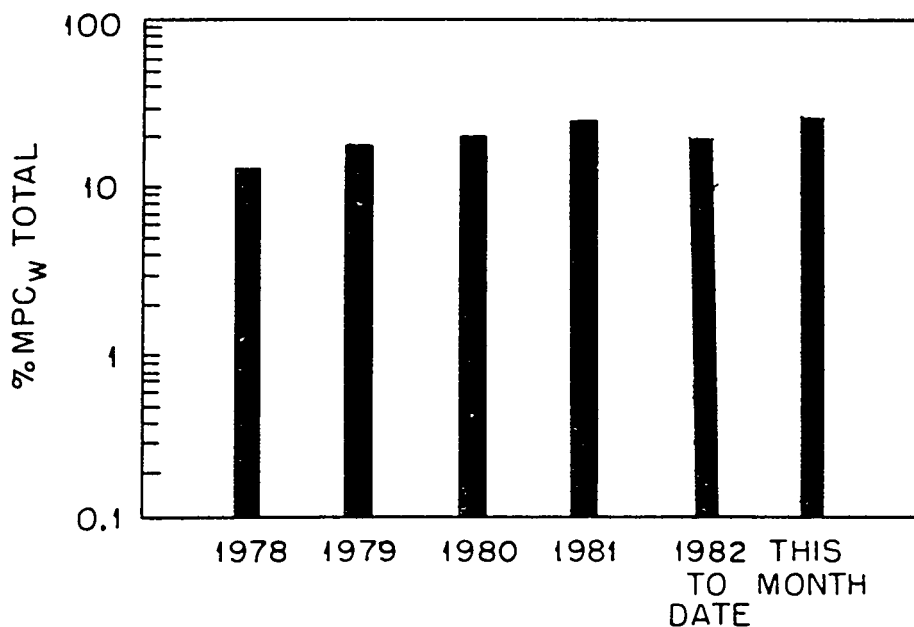


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

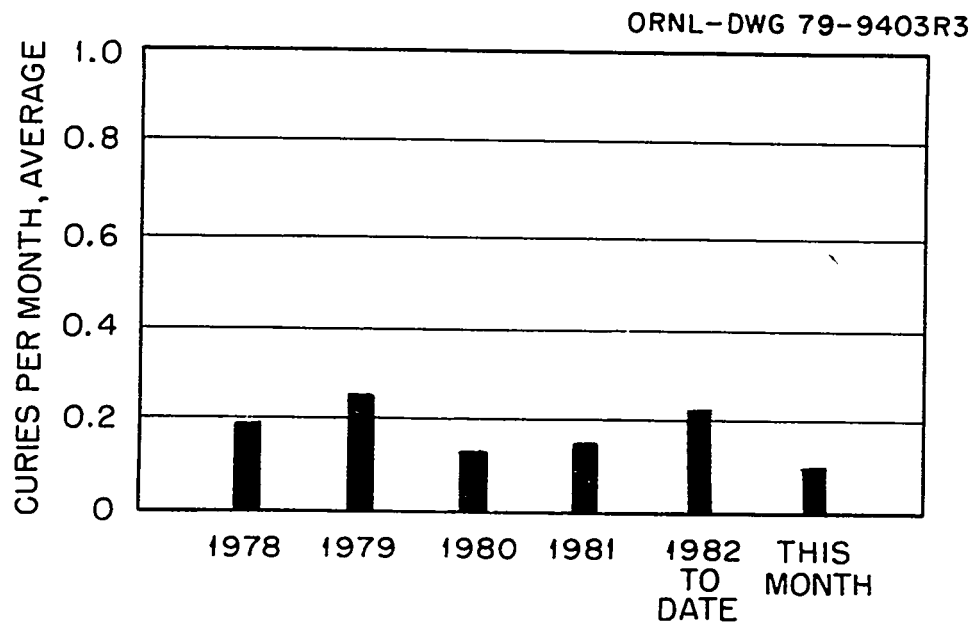


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 7).

ORNL-DWG 79-9404R3

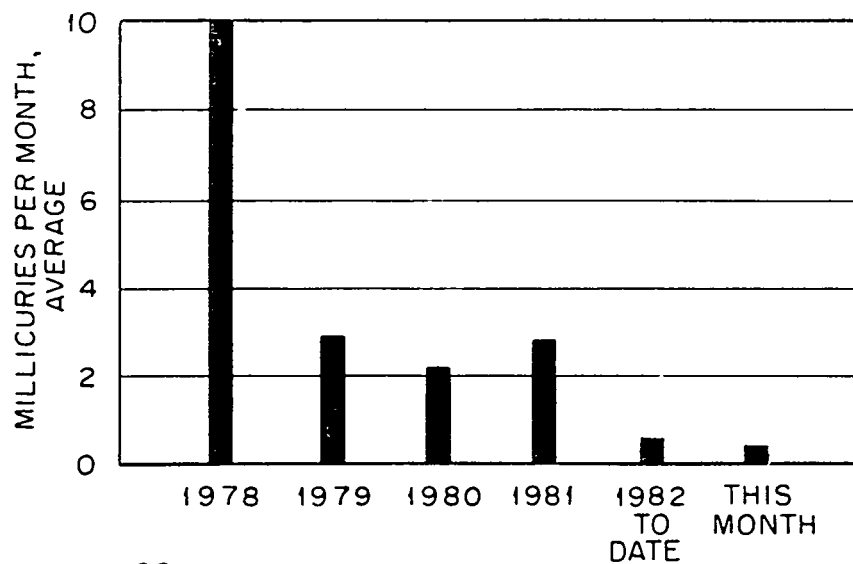


Fig. 3. ^{90}Sr Discharge in Process Waste to White Oak Creek

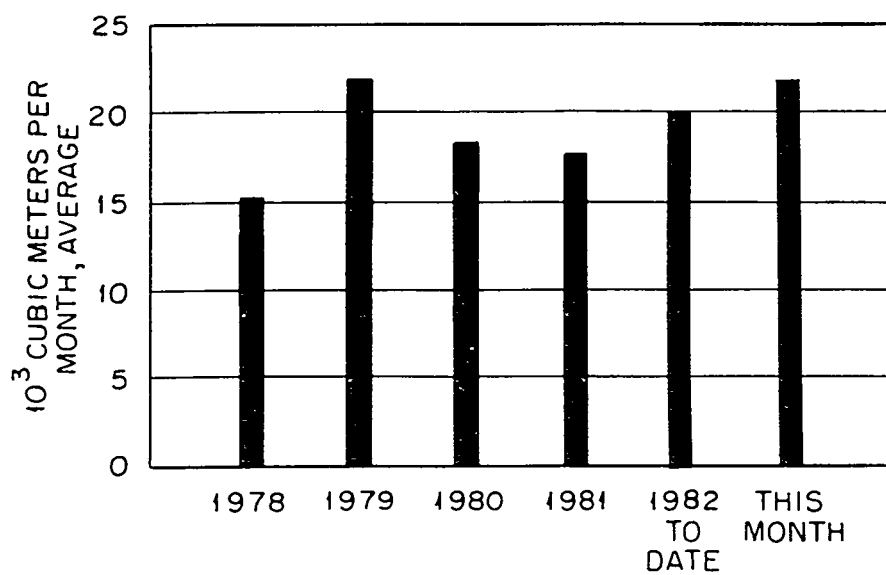


Fig. 4. Process Waste Volumes.

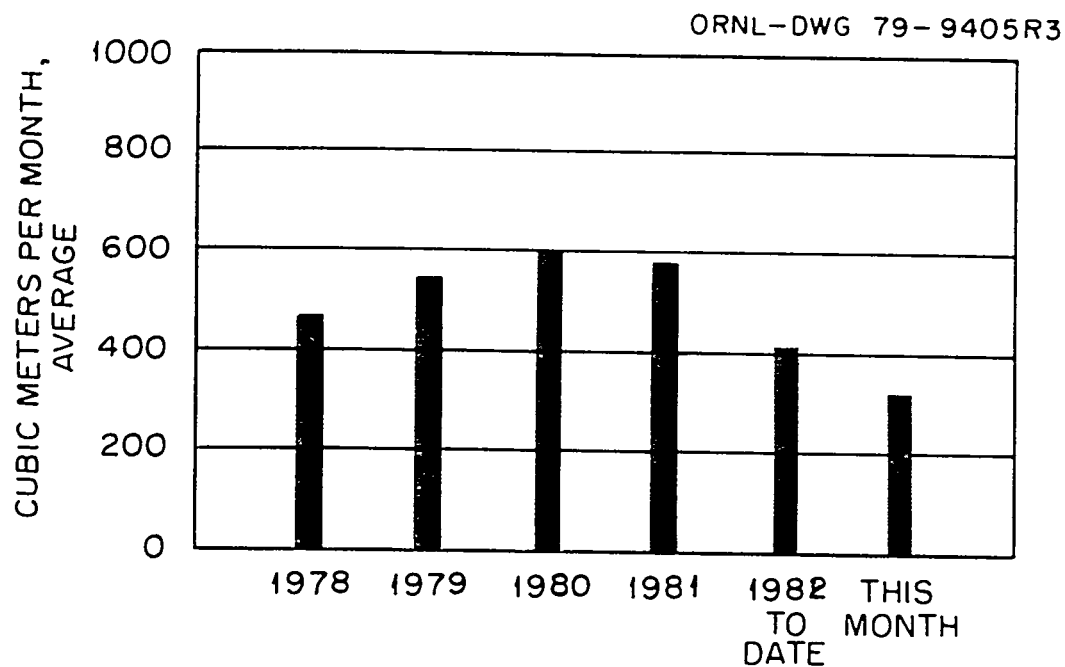


Fig. 5. Intermediate-Level Waste Volumes.

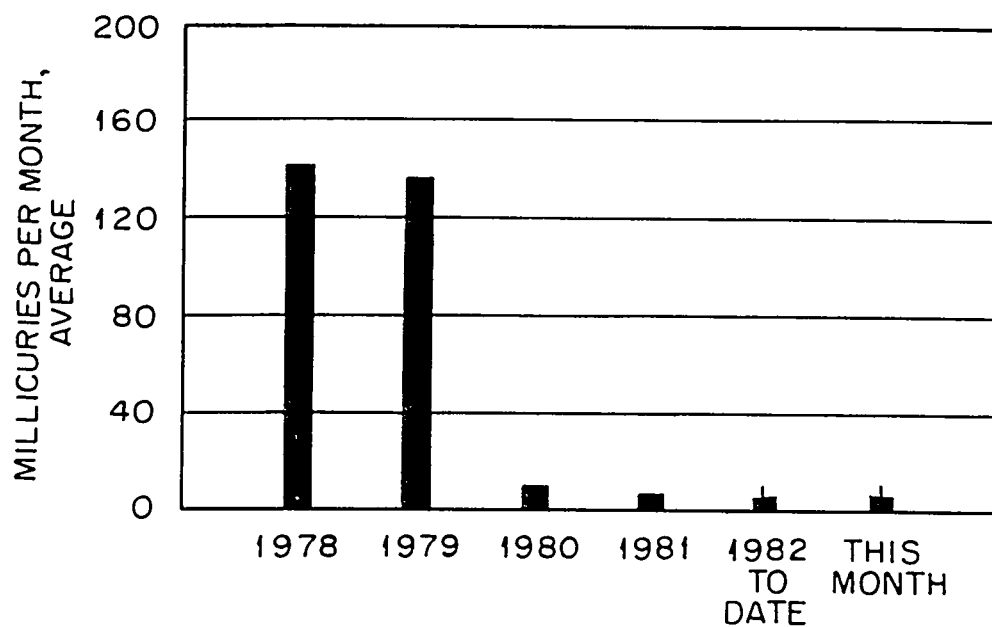


Fig. 6. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

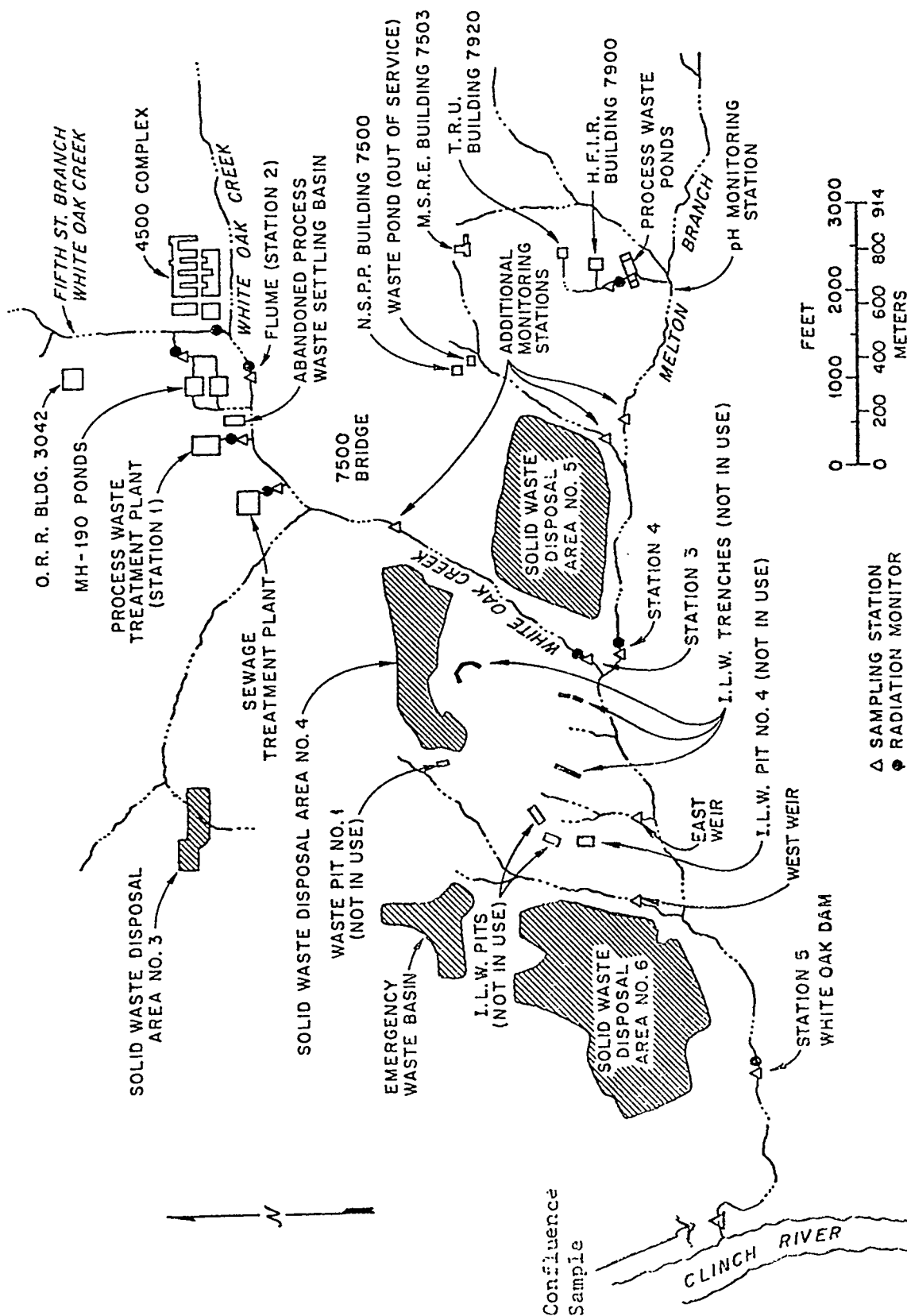


Fig. 7. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0685	0.452
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0210	0.075
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0015	-----
Total discharge from all sources		0.0911	0.527
White Oak Dam to Clinch River (ISAHP Measurement)		0.094	0.603

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr Bq/l	⁹⁰ Sr		Volume	
		Ci	% of Total	10 ³ m ³	% of Total
Radioisotopes Processing Area (MH234)	1100	0.080	6.6	2.68	13.1
Radioisotopes Processing Area (MH114 minus MH112)	----	0.260 ^a	21.5	1.11	5.4
Reactor Operations (MH112)	30	0.003	0.2	4.01	19.7
Buildings 3503 and 3508 (MH 229)	0.5	<0.001	----	1.10	5.4
Buildings 3025 and 3026 (MH 149)	21	<0.001	----	1.32	6.5
Building 3019 (MH 25)	7.3	<0.001	----	2.43	11.9
Waste Evaporator, Bldg. 2531 (MH 243)	11000	0.620	51.2	2.09	10.3
Building 3525 (MH 235)	13	<0.001	----	0.61	3.0
Building 2026 (MH 240)	1.1	<0.001	----	1.51	7.4
Tank Farm Drainage	2600	0.248	20.5	3.53	17.3

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a Ci	Filterable Particulate Activity ^b μCi
HRLAL 2026	< 0.01	1
Central Radioactive Gas Disposal Facilities 3039	< 0.01	183
Radiochemical-Processing Pilot Plant 3020	< 0.01	15
MSRE 7512	< 0.01	<1
HFIR and TRU 7911	< 0.01	46
Total Activity in Gases Released at X-10 Site	< 0.01	245
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	40.5 (³ H)	
Building 4508 Ventilation Discharges Room 136 Room 265		(c) 3.50 x 10 ⁻⁴
Building 5505 Discharges Glove Box Hood		2.25 x 10 ⁻³ 3.88 x 10 ⁻²

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.

DATE ISSUED

APR 28 1983

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-83/66

DATE: April 8, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND EFFLUENT
MONITORING REPORT FOR THE MONTH OF DECEMBER 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

Daniel R. Harvin 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

The construction of a temporary cell ventilation system at the 3039 Stack System continued during the period, and three partial shutdowns pertaining to this work were scheduled and completed successfully.

A scheduled waste injection (December 6) at the New Hydrofracture Facility was not completed because the well was inadvertently plugged off during a preliminary phase of the slotting operation.

Operation of the Monitoring and Collection Systems for the reporting period was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 442 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 81% of this total. The Industrial Safety and Applied Health Physics Division measured a 468 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of December was 0.3% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 32.8% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.468 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 133×10^4 and 38×10^4 m³, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 439.1 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 1.1 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 46.6 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	20.7	
190 Ponds	0.2	
Process Waste Treatment Plant	1.1	
Sewage Treatment Plant	<u>49.6</u>	
	71.6	
7500 Sampling Station	203.6	
Burial Grounds 1 and 3, and Floodplains		132.0
Station 3	359.0	
Burial Ground 4		155.4

Melton Branch

7900 Area (HFIR and TRU)	2.3	
7500 Area (NSPP and MSRE)	<u>7.1</u>	
	9.4	
Station 4	80.1	
Burial Ground 5		70.7

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>2.5</u>	
	2.6	
Total ⁹⁰ Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	441.7	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		358.1
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		81.1

Process Waste

A total of $2.32 \times 10^4 \text{ m}^3$ of contaminated waste was chemically treated this month. Of this amount, $2.12 \times 10^4 \text{ m}^3$ were released to the Creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 36 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (h)	53.5	30	35.7
Volume treated (m^3)	911	522	645

Intermediate Level Waste

The fourth injection of GTSR sludge scheduled for December 6 was not completed because the well was inadvertently plugged during a preliminary phase of the slotting operation. Subsequent investigation - circulation of a water solution of a dye - indicated that the tubing had apparently "backed off" and washed out at approximately 250 ft below surface. Consequently, the cement plug had not been properly displaced. A gamma log of the well "tagged" the cement at approximately 500 ft. Later examinations of the tubing string with a TV camera revealed "washed-out" holes at the 250- and 450-ft levels. Activities at the site were suspended pending the completion of a well recovery plan.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.65 m³/h.

The summary of storage operations is given below:

	<u>m³</u>
Total volume generated	421.1
Volume transferred to evaporators	481.4
South Tank Farm Inventory:	
Beginning of Month	921.3
End of Month	995.5
Service Tank Inventory:	
W-21, Beginning of Month	35.2
W-21, End of Month	60.0
W-22, Beginning of Month	107.5
W-22, End of Month	22.4
W-23, Beginning of Month	157.1
W-23, End of Month	133.5
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	998.5
Total Volume at End of Month	1,159.4

Approximately 232 m³ of a solution containing resuspended sludge from the gunite tanks (W-5) were transferred to the Melton Valley Storage Facility.

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	8.7
Building 3019	46.7
Building 3525	5.7
Radioisotopes Processing Area	87.4
ORR and BSR	54.0
High Flux Isotope Reactor	60.0
Fission Products Development Laboratory	9.5*
4500 Complex	49.2
Building 3544	39.5

Gaseous Waste

The ORNL stacks discharged <1 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was less than 170 μ Ci. Inert gases released from the 3039 and 7911 stacks averaged less than 1.7% and 0.2% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

During the month of December, there were three partial shutdowns in the 3039 stack area, as construction pertaining to improving the 3039 off-gas and cell ventilation facilities continued.

*The storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to ILW since it was designed in this fashion.

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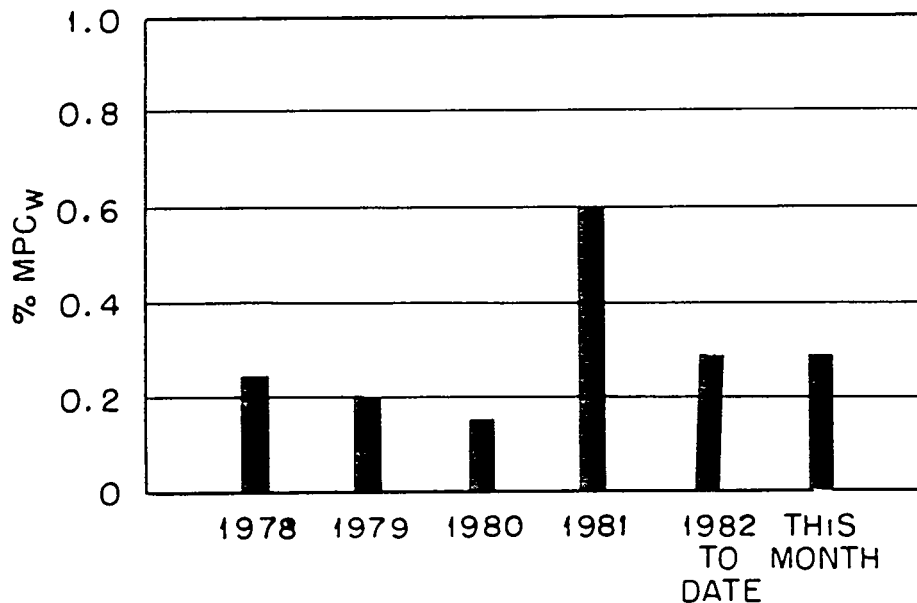


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

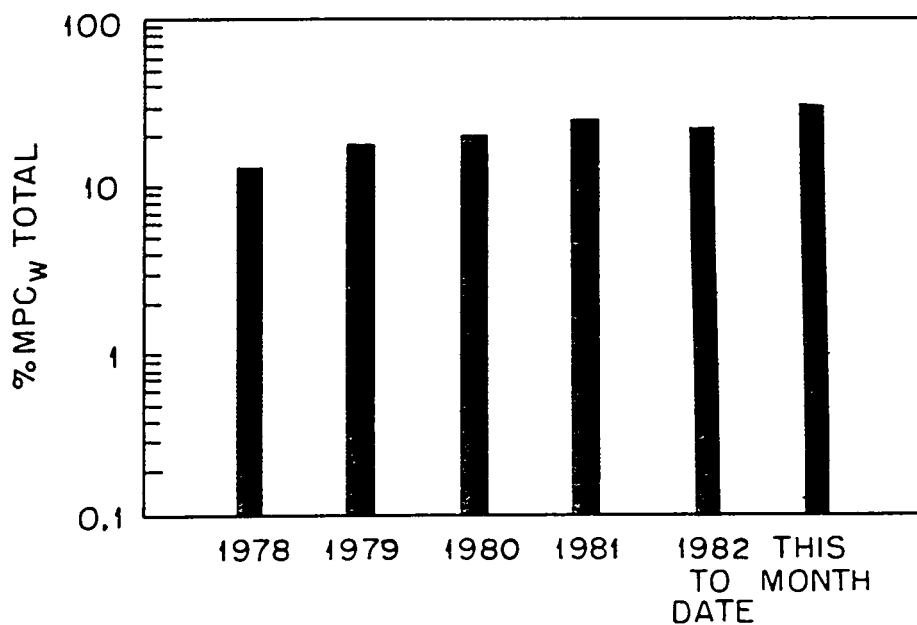


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

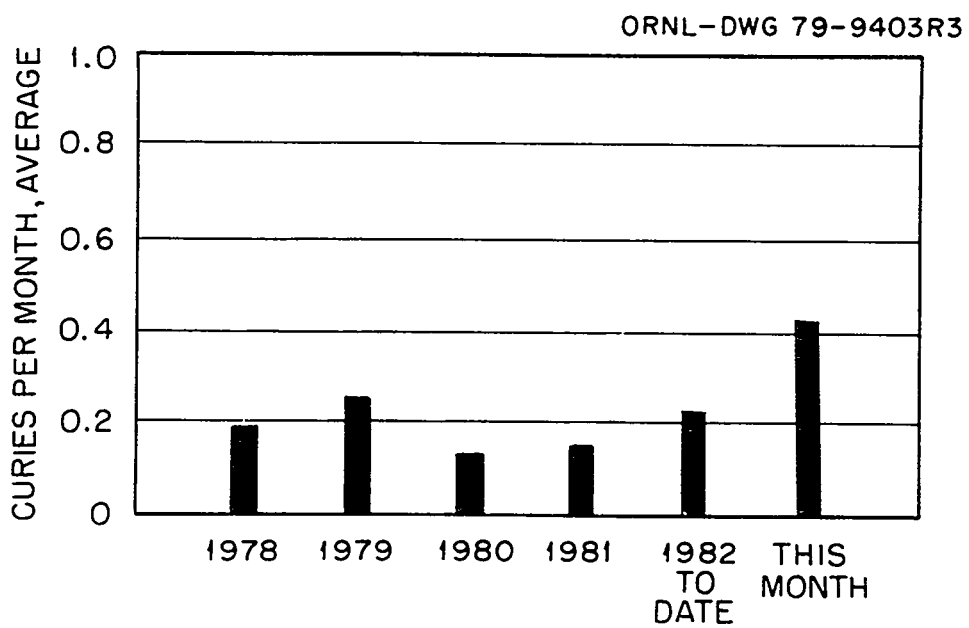


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3).

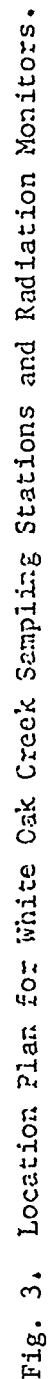


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

ORNL-DWG 79-9404R3

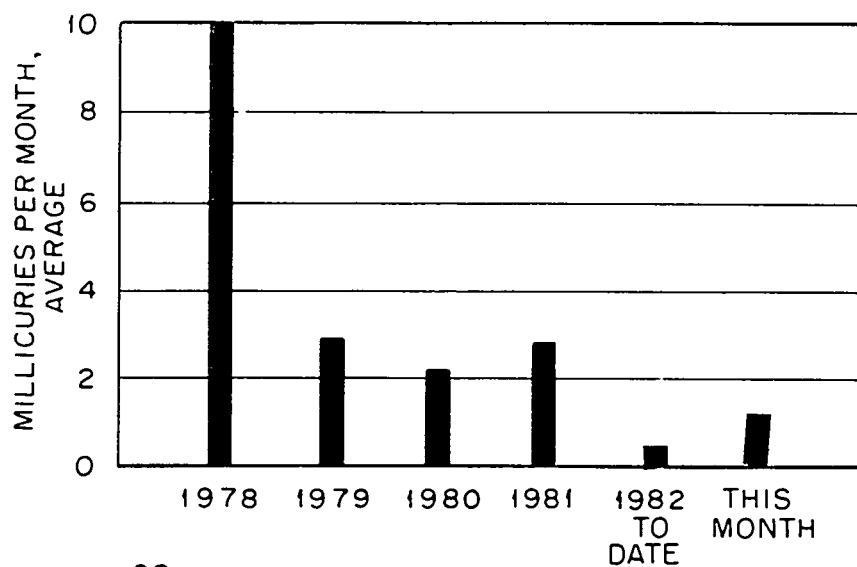


Fig. 4. ^{90}Sr Discharge in Process Waste to White Oak Creek

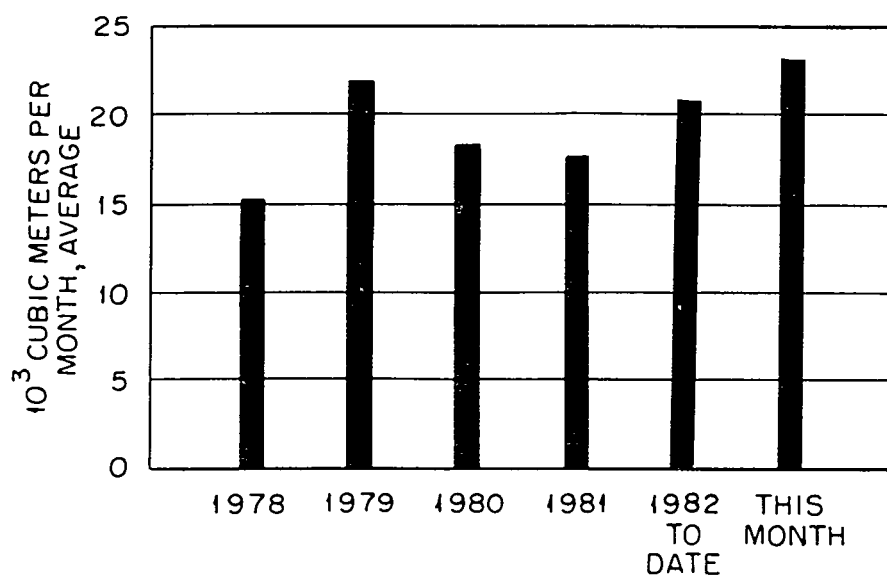


Fig. 5. Process Waste Volumes.

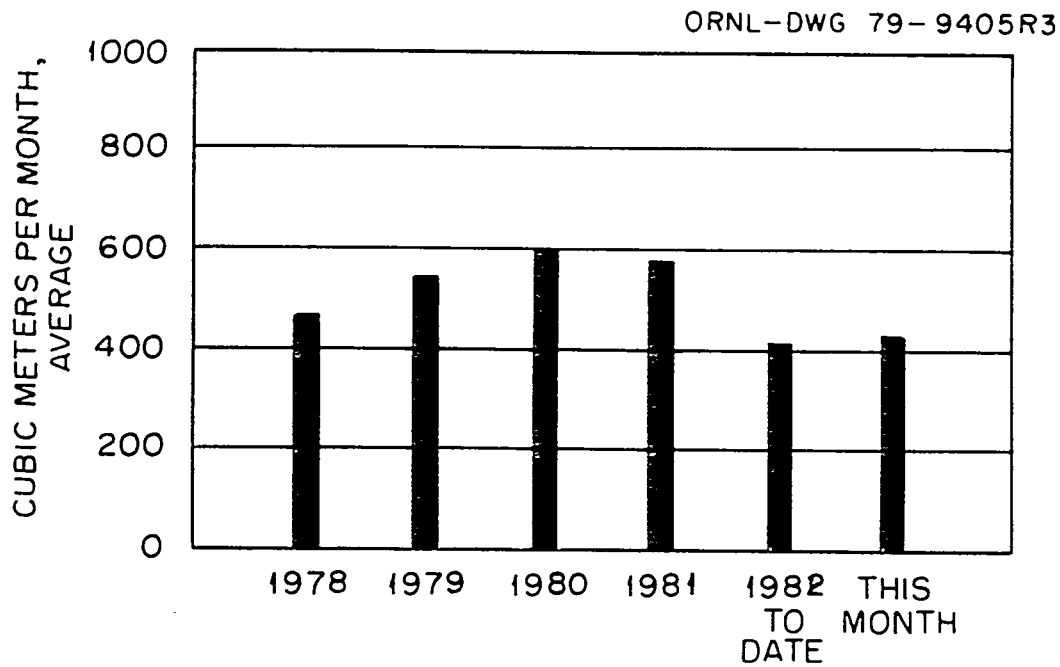


Fig.6. Intermediate-Level Waste Volumes.

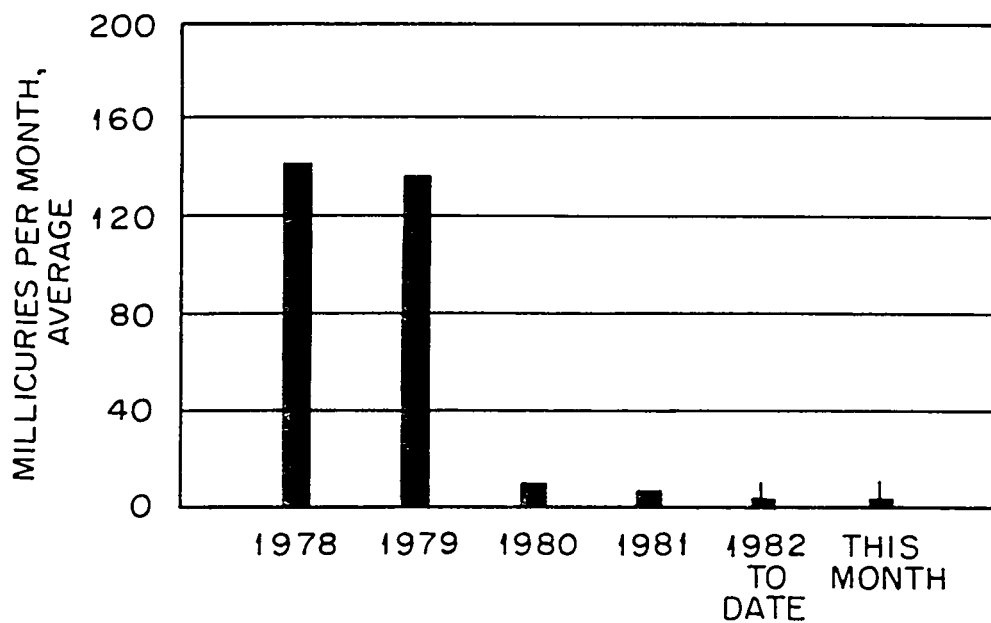


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.3590	0.9334
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0801	0.1926
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0025	-----
Total discharge from all sources		0.4417	1.1260
White Oak Dam to Clinch River (ISAHF Measurement)		0.4680	1.930

^aRefers to Figure 7.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr Bq/l	⁹⁰ Sr		Volume	
		Ci	% of Total	10 ³ m ³	% of Total
Radioisotopes Processing Area (MH234)	4600	0.425	29.1	3.42	14.1
Radioisotopes Processing Area (MH114 minus MH112)	----	0.322 ^a	22.0	1.82	7.5
Reactor Operations (MH112)	41	0.005	0.3	4.55	18.7
Buildings 3503 and 3508 (MH 229)	0.6	<0.001	----	1.40	5.8
Buildings 3025 and 3026 (MH 149)	1200	0.050	3.4	1.55	6.4
Building 3019 (MH 25)	0.1	<0.001	----	1.90	7.8
Waste Evaporator, Bldg. 2531 (MH 243)	380	0.021	1.4	2.08	8.6
Building 3525 (MH 235)	2.8	<0.001	----	0.99	4.1
Building 2026 (MH 240)	0.7	<0.001	----	1.44	5.9
Tank Farm Drainage	4600	0.638	43.8	5.14	21.1

^aThe activity entered the process-waste system with inleakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a Ci	Filterable Particulate Activity ^b μCi
HRLAL 2026	< 0.01	1
Central Radioactive Gas Disposal Facilities 3039	< 0.01	146
Radiochemical-Processing Pilot Plant 3020	< 0.01	16
MSRE 7512	< 0.01	<1
HFIR and TRU 7911	< 0.01	6
Total Activity in Gases Released at X-10 Site	< 0.01	170
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	1 (³ H)	
Building 4508 Ventilation Discharges Room 136 Room 265		4.63 x 10 ⁻³ 1.05 x 10 ⁻³
Building 5505 Discharges Glove Box Hood		6.75 x 10 ⁻³ 1.16 x 10 ⁻¹

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-83/67

DATE: April 14, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF JANUARY 1983

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

David R. Himmick 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Construction at the 3039 Stack Area continued on schedule through the reporting period; a temporary two-fan system (70 K cfm and 65 K cfm each) was placed in service, and it now provides cell ventilation for the Bethel Valley facilities. The original equipment will be replaced over a 1.5 year period.

Tri State Oil Tool Industries, Inc., Laurel, Mississippi, oil well salvage specialists, began well recovery operations at the New Hydrofracture Facility on January 9. Approximately 340 ft of the well have been cleared of tubing and cement.

Operation of the Waste Monitoring and Collection Systems for the month of January was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 235 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 82% of this total. The Industrial Safety and Applied Health Physics Division measured a 267 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of January was 0.2% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 31.0% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.267 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 96×10^4 and 16×10^4 m³, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 233.7 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.5 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 19.7 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

<u>White Oak Creek</u>		
	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By</u> <u>Measurement</u>	<u>By</u> <u>Difference</u>
Flume	16.5	
190 Ponds	0.2	
Process Waste Treatment Plant	0.5	
Sewage Treatment Plant	<u>19.7</u>	
	36.9	
7500 Sampling Station	93.0	
Burial Grounds 1 and 3, and Floodplains		56.1
Station 3	180.9	
Burial Ground 4		87.9
<u>Melton Branch</u>		
7900 Area (HFIR and TRU)	0.7	
7500 Area (NSPP and MSRE)	<u>3.9</u>	
	4.6	
Station 4	52.8	
Burial Ground 5		48.2
<u>ILW Pit Disposal Area</u>		
East Weir	0.1	
West Weir	<u>1.3</u>	
	1.4	
Total ⁹⁰ Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	235.1	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		193.6
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		82.4

Process Waste

A total of $2.13 \times 10^4 \text{ m}^3$ of contaminated waste was chemically treated this month. Of this amount, $2.04 \times 10^4 \text{ m}^3$ were released to the Creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 33 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (h)	44.5	21.5	30.8
Volume treated (m^3)	750	417	491

Intermediate Level Waste

Tri State Oil Tool Industries, Inc. began well recovery operations on January 9, and on January 13 all of the cement had been drilled from the 2 7/8 in. tubing string using a 2 1/4 in. mill and 1 1/4 in. drill pipe with fluid circulation. At this point, it was discovered that the 2 7/8 in. string had parted and approximately 500 ft of the string had fallen about 19 ft to the bottom of the hole. The system was rerigged and a "washover" operation was initiated. This operation entails milling away the cement from the annular space between the 2 7/8 in. tubing and 5 1/2 in. casing and circulating the cement chips to surface. A 4 3/8 in. shoe and wash pipe are used. The freed tubing is severed with a jet cutter, pulled to the surface, and discarded. To date, about 340 ft of well have been cleared.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was $0.39 \text{ m}^3/\text{h}$.

The summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	252.8
Volume transferred to evaporators	291.7
South Tank Farm Inventory:	
Beginning of Month	995.5
End of Month	1,000.1
Service Tank Inventory:	
W-21, Beginning of Month	60.0
W-21, End of Month	17.7
W-22, Beginning of Month	22.4
W-22, End of Month	25.8
W-23, Beginning of Month	133.5
W-23, End of Month	76.9
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	1,159.4
Total Volume at End of Month	968.7

The gunite tank sludge removal operation was shut down for the month of January due to lack of storage space for the resuspended sludge solution.

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	2.8
Building 3019	6.4
Building 3525	3.3
Radioisotopes Processing Area	27.4
ORR and BSR	51.1
High Flux Isotope Reactor	24.7
Fission Products Development Laboratory	20.8*
4500 Complex	32.7
Building 3544	35.8

Gaseous Waste

The ORNL stacks discharged <1 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was less than 44 μ Ci. Inert gases released from the 3039 and 7911 stacks averaged less than 2.1% and 0.7% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

During the month of January, several partial shutdowns and a total shutdown took place in the 3039 stack area. During these shutdowns, the existing electric blowers and steam turbines in the cell ventilation

*The storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to ILW since it was designed in this fashion.

system were removed and replaced with two electric units which will service the cell ventilation for the entire area. Each of the blower units is equipped with a primary fan and a back-up fan. These units are temporary and will service the area for one to two years, while permanent blowers are being installed.

In the off-gas system, a new scrubber was installed and is being prepared for operation. Also, construction continued in preparation for replacing the off-gas filter system with a new system. A new steam system was tied in at the scrubber area.

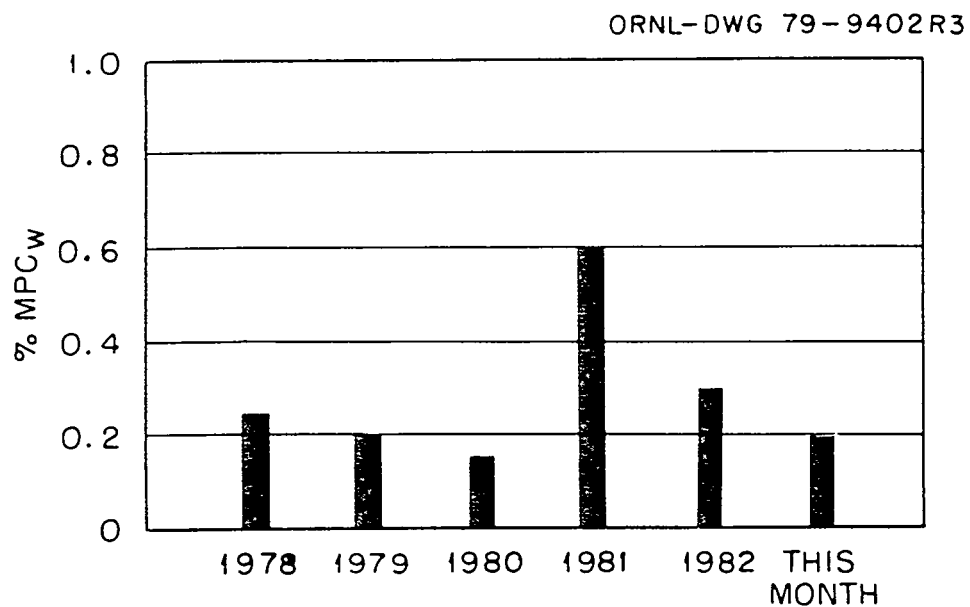


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

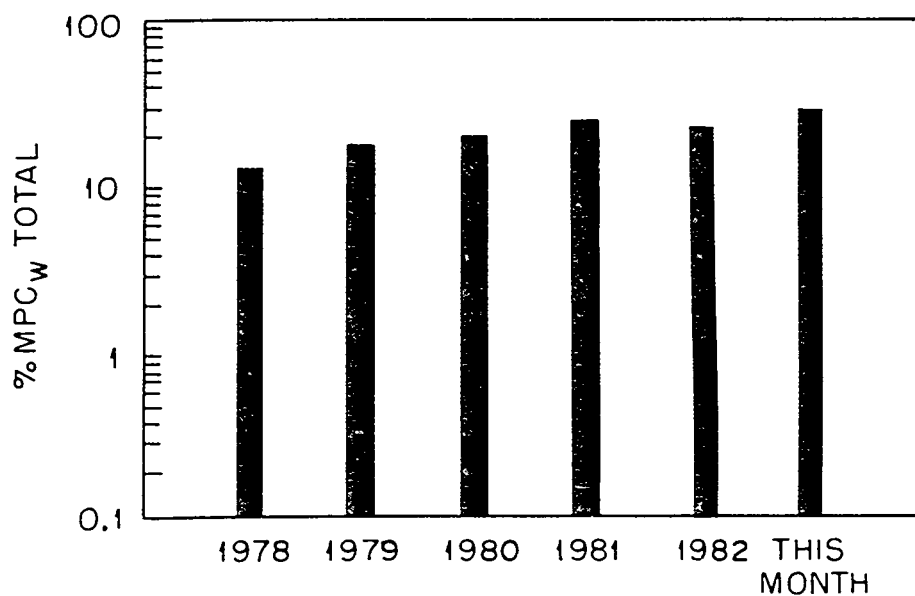


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

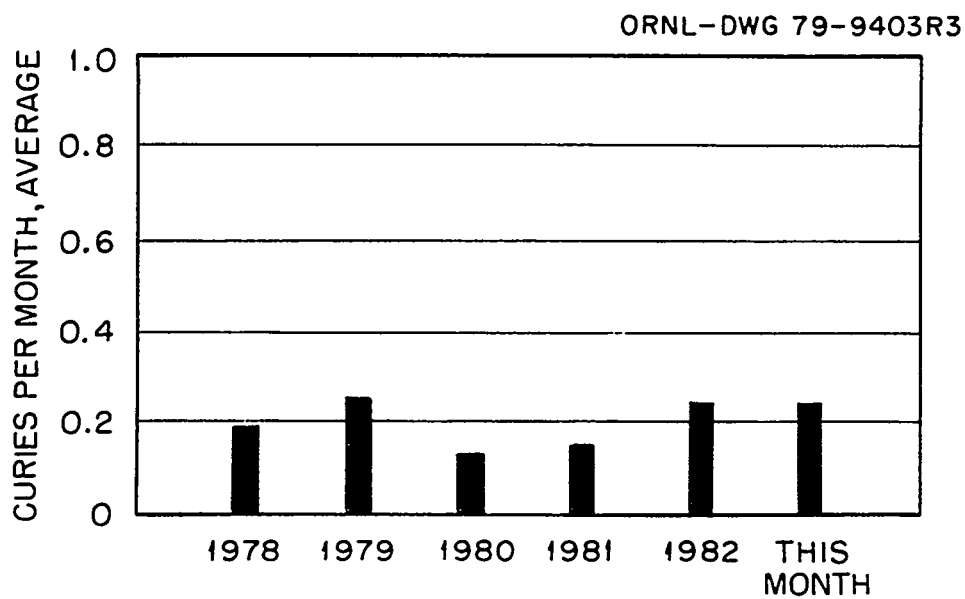


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7).

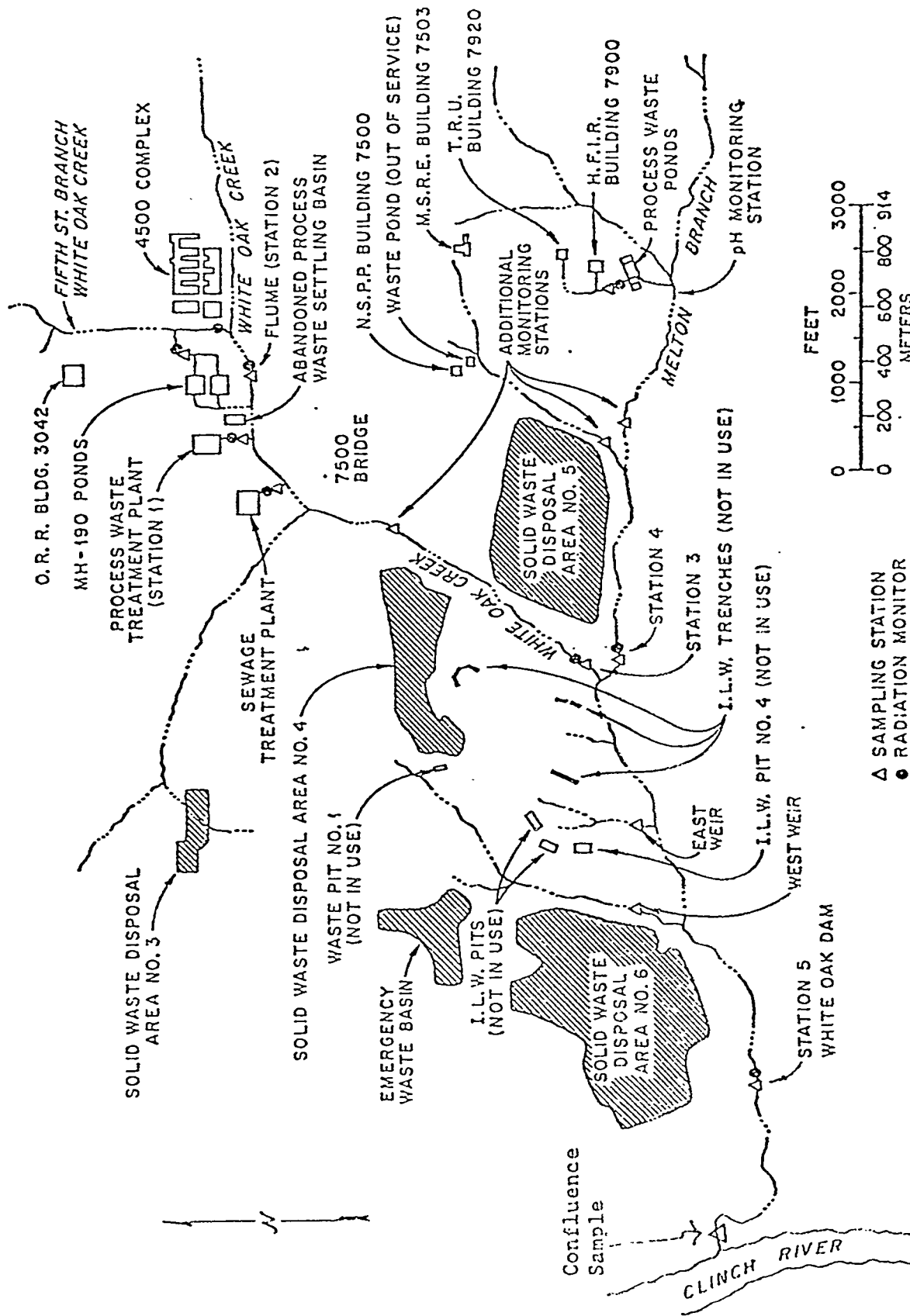


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

ORNL-DWG 79-9404R3

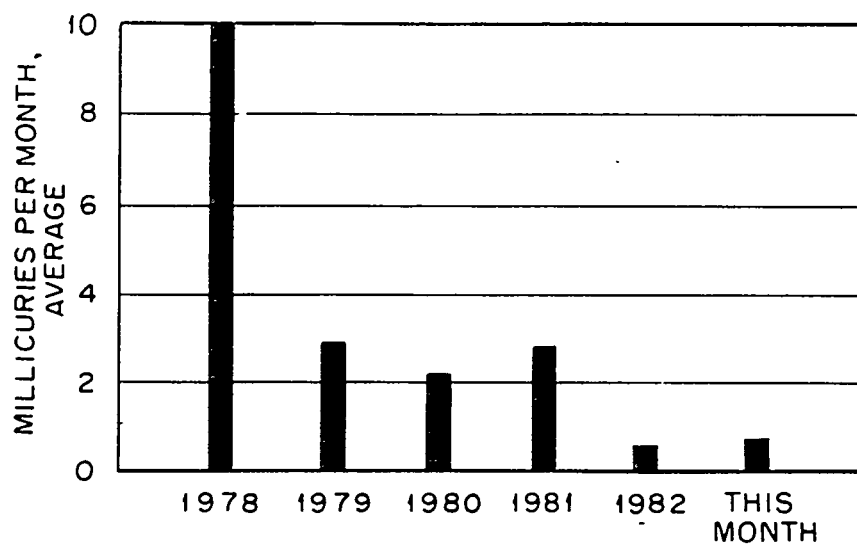


Fig. 4. ^{90}Sr Discharge in Process Waste to White Oak Creek

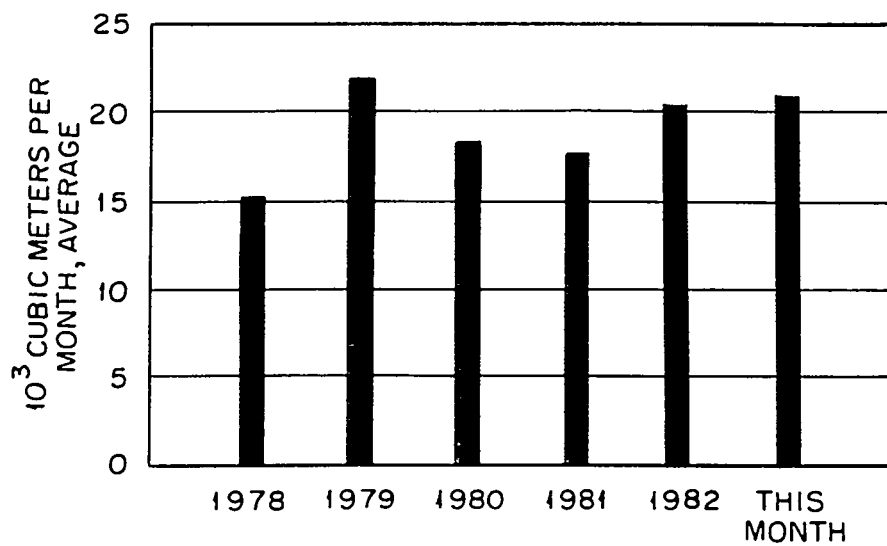


Fig. 5. Process Waste Volumes.

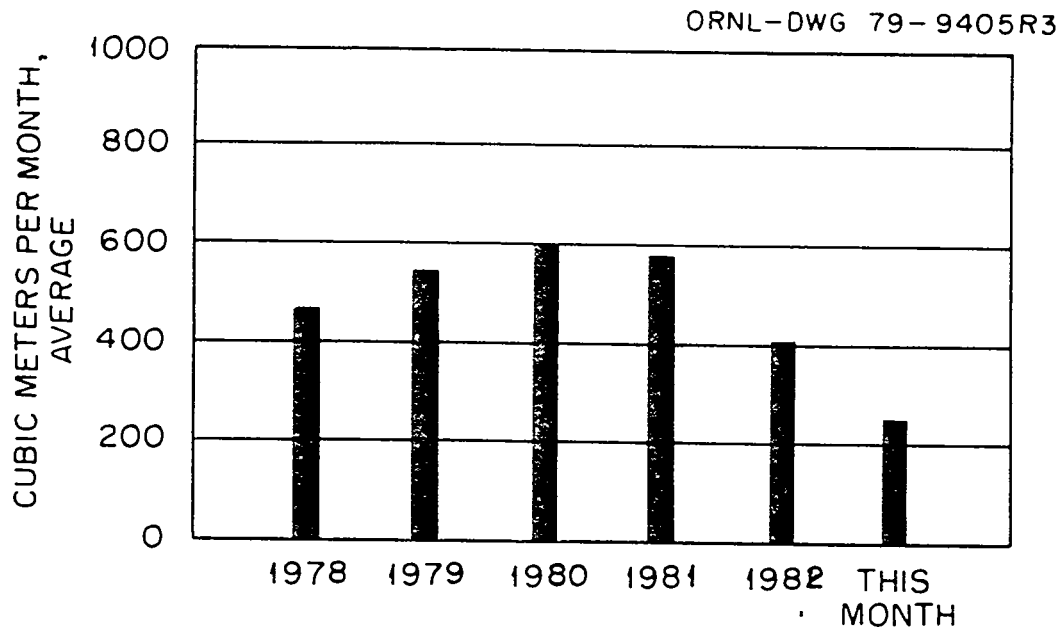


Fig.6. Intermediate-Level Waste Volumes.

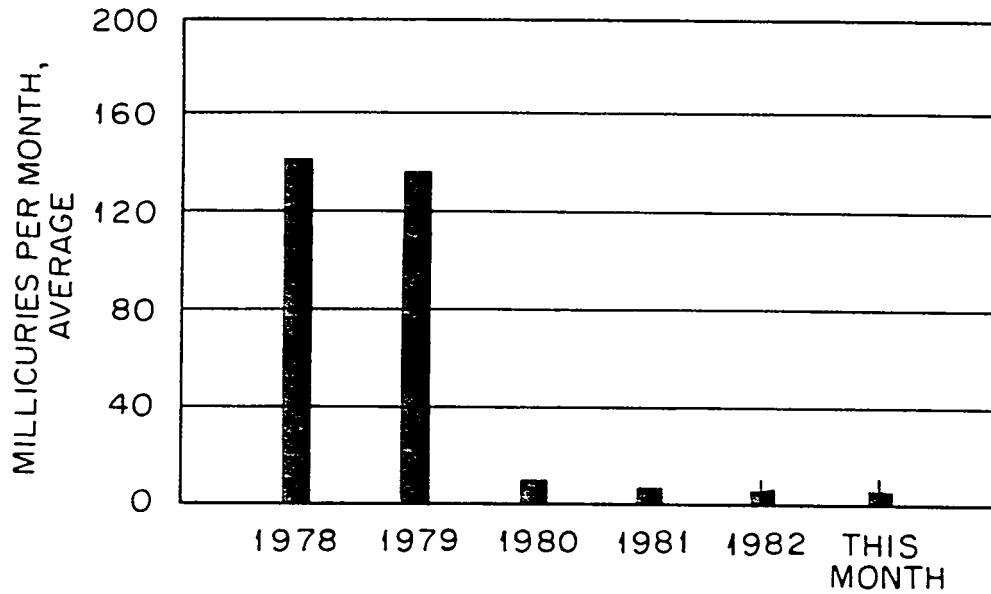


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Curies	Gross Beta Curies ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.1809	0.775
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0528	0.158
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0013	-----
Total discharge from all sources		0.2351	0.933
White Oak Dam to Clinch River (ISAHP Measurement)		0.267	0.570

^aRefers to Figure 3.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr Bq/l	⁹⁰ Sr		Volume	
		Ci	% of Total	10 ³ m ³	% of Total
Radioisotopes Processing Area (MH234)	4000	0.378	33.3	3.50	13.6
Radioisotopes Processing Area (MH114 minus MH112)	----	0.348	30.7	5.90	22.9
Reactor Operations (MH112)	25	0.002	0.2	3.58	13.9
Buildings 3503 and 3508 (MH 229)	0.6	<0.001	----	1.26	4.9
Buildings 3025 and 3026 (MH 149)	51	<0.002	0.2	1.24	4.8
Building 3019 (MH 25)	5.4	<0.001	----	1.68	6.5
Waste Evaporator, Bldg. 2531 (MH 243)	270	0.014	1.2	1.85	7.2
Building 3525 (MH 235)	0.8	<0.001	----	1.16	4.5
Building 2026 (MH 240)	0.7	<0.001	----	1.63	6.3
Tank Farm Drainage	3700	0.390	34.4	3.91	15.4

^aThe activity entered the process-waste system with inleakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a Ci	Filterable Particulate Activity ^b μCi
HRLAL 2026	< 0.01	1
Central Radioactive Gas Disposal Facilities 3039	< 0.01	22
Radiochemical-Processing Pilot Plant 3020	< 0.01	10
MSRE 7512	< 0.01	1
HFIR and TRU 7911	< 0.01	10
Total Activity in Gases Released at X-10 Site	< 0.01	44
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	0.5 (³ H)	
Building 4508 Ventilation Discharges Room 136 Room 265		4.63x10 ⁻³ 1.05x10 ⁻³
Building 5505 Discharges Glove Box Hood		6.75x10 ⁻³ 1.16x10 ⁻¹

^aActivity primarily ¹³¹I except as noted.^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.^cNo data available at this time.

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CENTRAL FILES NUMBER

ORNL CF-83/213

DATE: May 31, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF FEBRUARY, 1983

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

Dan R. Hamish 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

The normal operating unit of Fan Assembly A-B, which provides cell ventilation service at the 3039 Stack Area, failed as a result of an electrical short which damaged the motor starter control. The unit was out of service for a period of five days.

The well salvage operation at the New Hydrofracture Facility continued on a round-the-clock basis through the reporting period. To date, 778 ft of the well have been reclaimed.

Operation of the Waste Monitoring and Collection Systems for the month of February was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 309 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 86% of this total. The Industrial Safety and Applied Health Physics Division measured a 293 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 3 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of February was 0.3% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 38.9% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.293 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Station 3 and 4 were 109×10^4 and 26×10^4 m³, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 305.7 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.4 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.4 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 28.4 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ⁹⁰Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (Fig. 3).

White Oak Creek

	<u>⁹⁰Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	9.1	
190 Ponds	0.4	
Process Waste Treatment Plant	0.4	
Sewage Treatment Plant	28.4	
	<u>38.3</u>	
7500 Sampling Station	113.4	
Burial Grounds 1 and 3, and Floodplain		75.1
Station 3	237.3	
Burial Ground 4		123.9

Melton Branch

7900 Area (HFIR and TRU)	0.9	
7500 Area (NSPP and MSRE)	<u>5.2</u>	
	6.1	
Station 4	68.4	
Burial Ground 5		62.3

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>2.7</u>	
	2.8	
Total ⁹⁰ Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	308.5	
Total ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		264.1
Percent ⁹⁰ Sr from Burial Grounds, Ground Disposal Area, and Floodplains		85.6

Process Waste

A total of $1.81 \times 10^4 \text{ m}^3$ of contaminated waste was chemically treated this month. Of this amount, $1.71 \times 10^4 \text{ m}^3$ were released to the creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 30 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (Hours)	45.5	17.75	33
Volume Treated (m^3)	798	403	603

Intermediate Level Waste

NHF well recovery operations continued through the period. During the washover operation, a 12-ft slab was cut from the 5 1/2-in. casing at approximately 760 ft, and drilling operations were initiated at this depth when a core of shale was brought to surface in the washover shoe. The goal was to drill about 300 ft of new hole to 1,050 ft. The drilling progressed to about 868 ft where a drill collar pin sheared and two oil jars, the collar, and bit were left in the hole. Subsequent efforts to retrieve the tools were unsuccessful. In fact, the string now bottomed at 755 ft, and it was surmised that the casing had shifted. Washover was resumed and a second slab of casing and core of shale were eventually brought out of the hole. The drilling operation was then resumed and has progressed to 778 ft.

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.55 m³/hr.

A summary of storage operations is given below:

	m ³
Total Volume Generated	408.4
Volume Transferred to Evaporators	367.9
South Tank Farm Inventory:	
Beginning of Month	1,000.1
End of Month	1,000.1
Service Tank Inventory:	
W-21, Beginning of Month	17.7
W-21, End of Month	27.4
W-22, Beginning of Month	25.8
W-22, End of Month	56.6
W-23, Beginning of Month	76.9
W-23, End of Month	101.9
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	968.7
Total Volume at End of Month	1,011.6

A list of major contributors of intermediate level waste is given below.

Figure 6 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	10.7
Building 3019	27.6
Building 3525	7.8
Radioisotopes Processing Area	108.2
ORR and BSR	7.9
High Flux Isotope Reactor	21.7
Fission Products Development Laboratory	57.0
4500 Complex	27.4
Building 3544	49.7

Gaseous Waste

The ORNL Stacks discharged <3 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was less than 109 µCi. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.0% and 0.7% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The pit can only be jetted to ILW since it was designed in this fashion.

On February 22, the normal operating unit of fan system A-B failed when an electrical short occurred in the terminal block which connects the motor leads to the power supply. The redundant system was actuated and came on-line per design. The A-B unit supplies cell ventilation service at the 3039 area, and it is a temporary system which was placed in service January 20, 1983.

The electrical fault appears to have resulted from a modified terminal block and possibly loose set screws holding the motor leads to the block. The terminal block and set screw connections were badly melted, and it was also necessary to replace the power leads.

Normal operations were resumed on February 27. The incident is reported in OIR No. OP-WM-OIR-9-1.

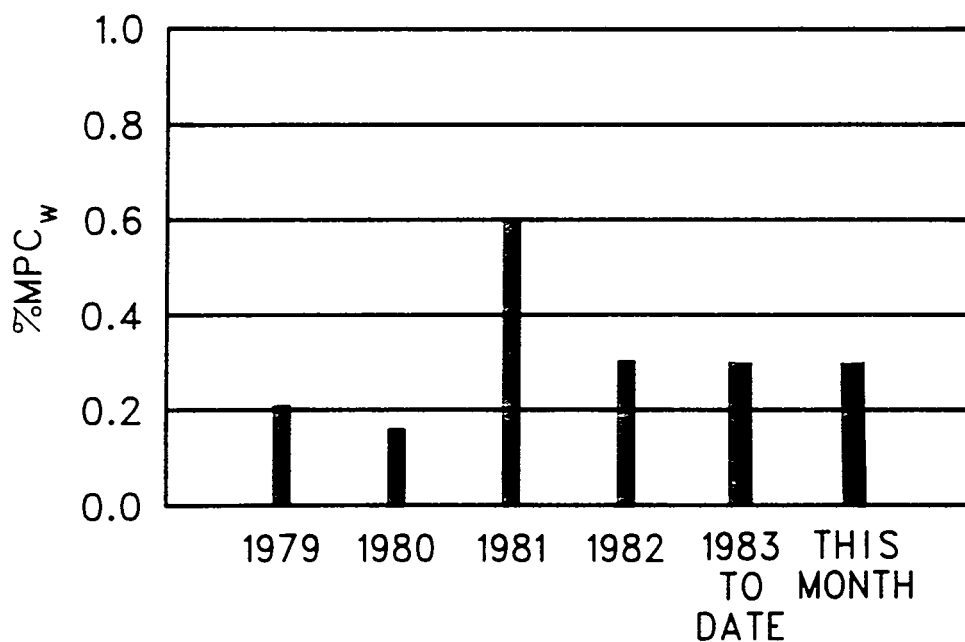


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

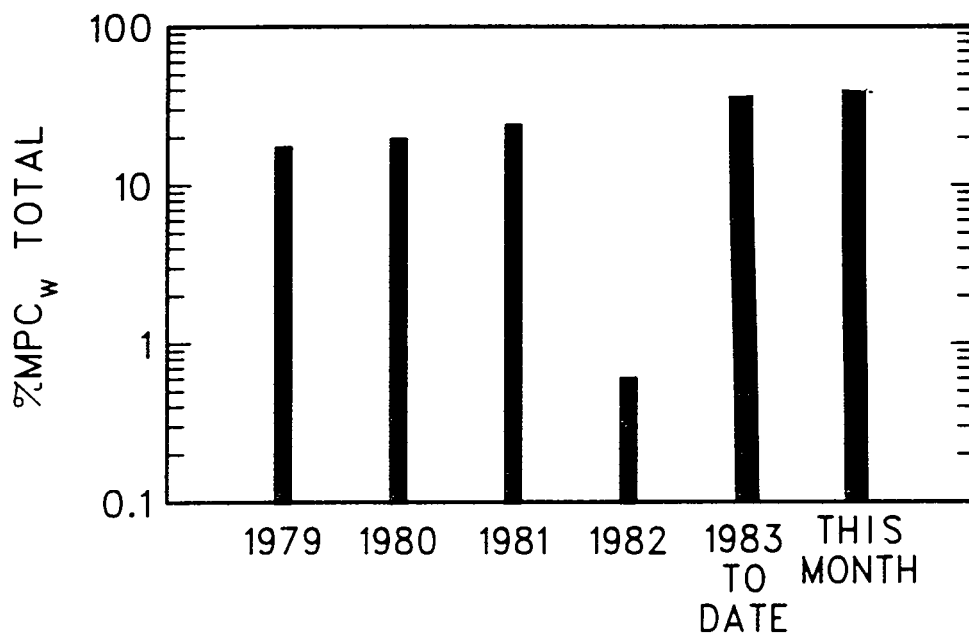


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

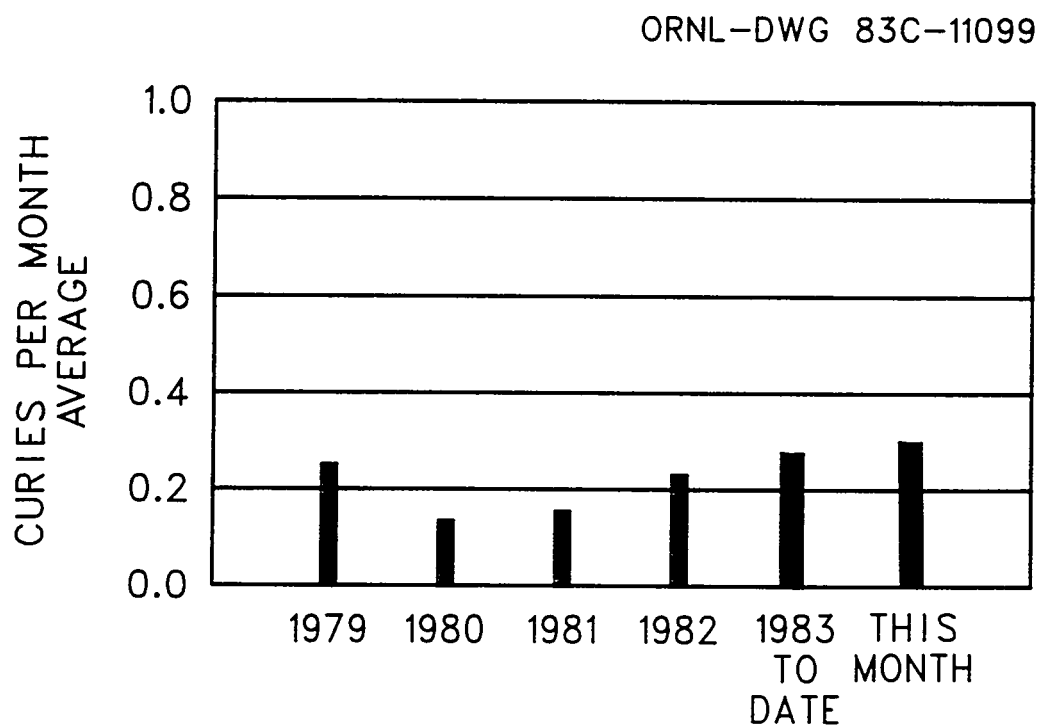


Fig.2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7)

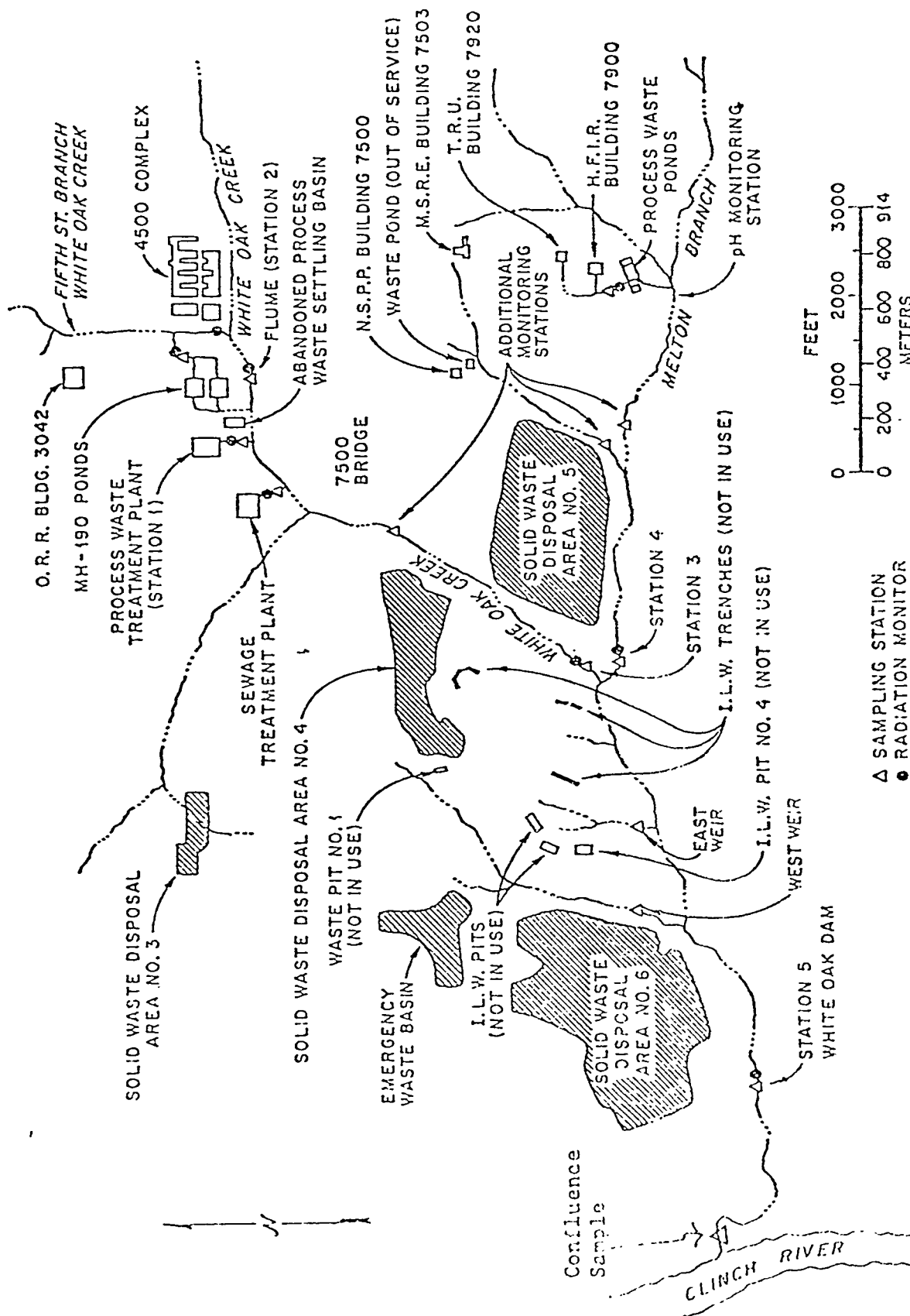


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

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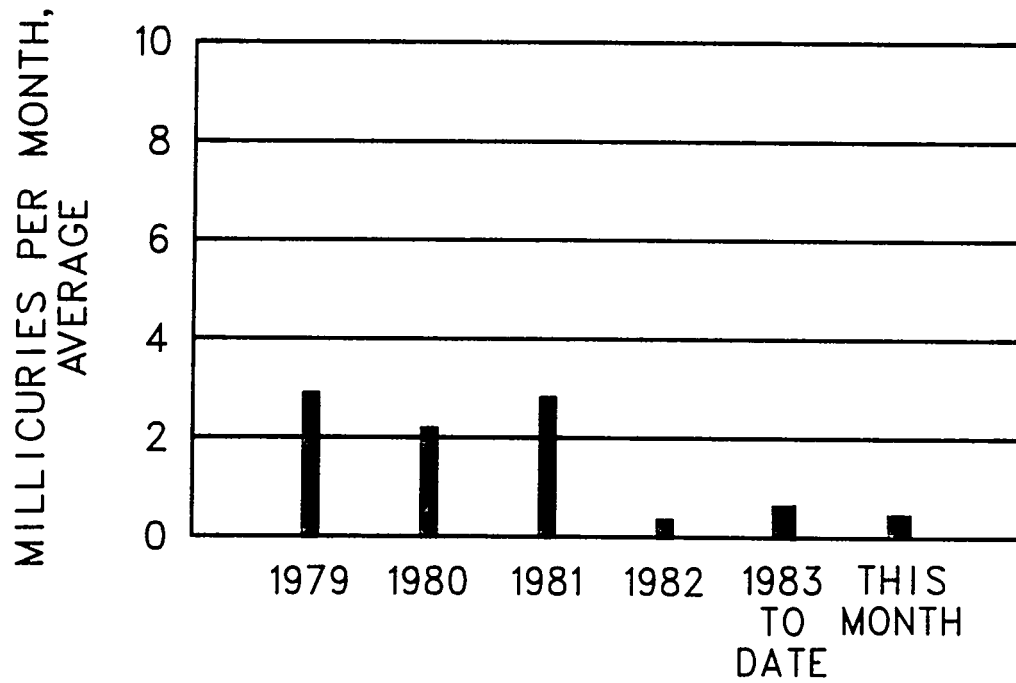
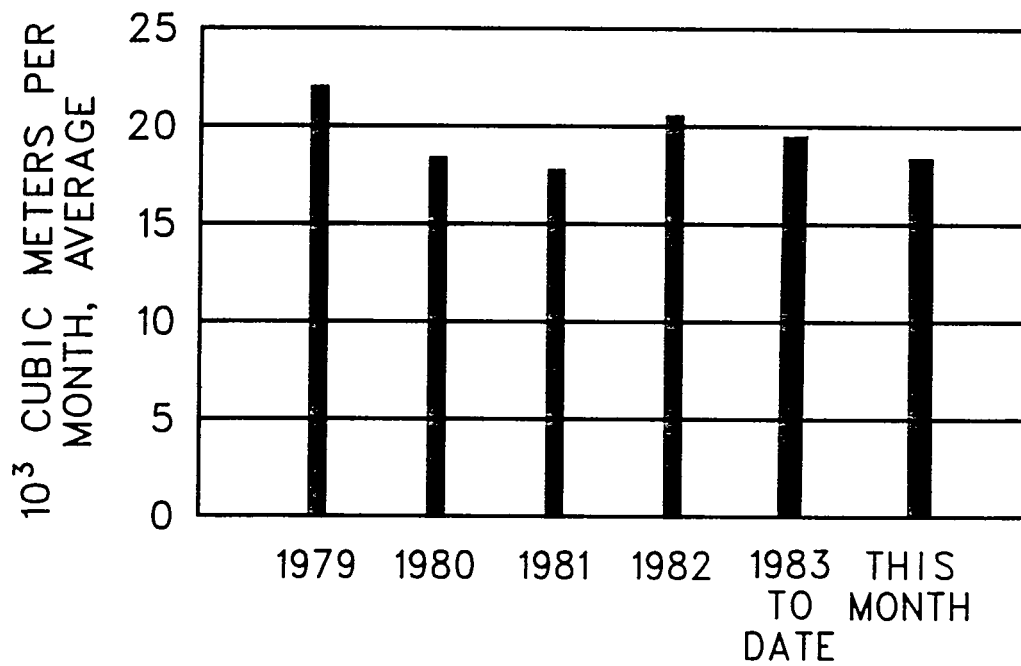
Fig.4. ^{90}Sr Discharge in Waste to White Oak Creek

Fig.5. Process Waste Volumes.

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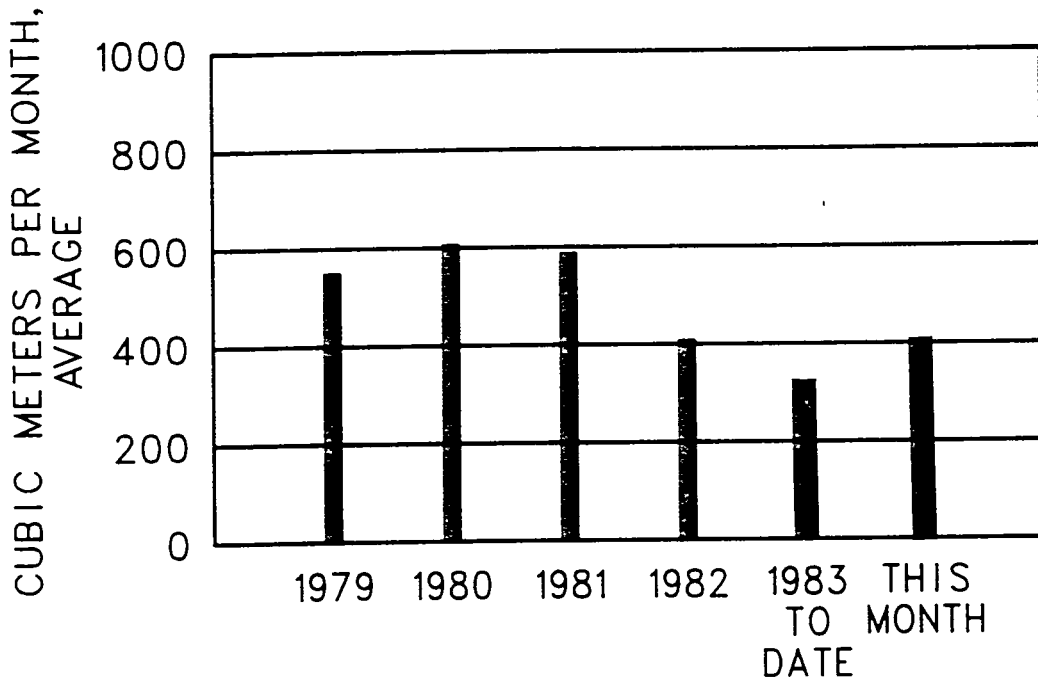


Fig.6. Intermediate-Level Waste Volumes.

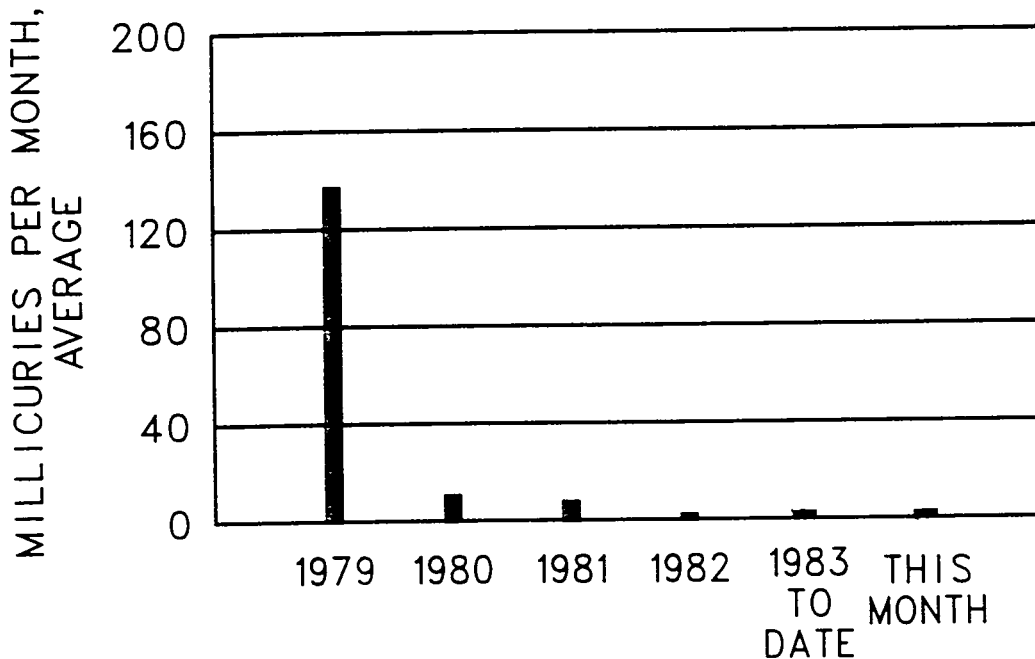


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta, Cib
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.2373	0.791
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0684	0.183
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0027	
Total discharge from all sources		0.3085	0.974
White Oak Dam to Clinch River (ISAHP Measurement)		0.293	0.678

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	⁹⁰ Sr Bq/l	Ci	% of Total	10 ³ m ³	% of Total
Radioisotopes Processing Area (MH234)	1,600	0.164	15.9	3.79	18.9
Radioisotopes Processing Area (MH114 minus MH112)	----	0.324	31.3	1.44	7.2
Reactor Operations (MH112)	41	0.004	0.4	3.85	19.2
Buildings 3503 and 3508 (MH 229)	0.6	<0.001	----	1.42	7.1
Buildings 3025 and 3026 (MH 149)	88	0.003	0.3	1.09	5.4
Building 3019 (MH 25)	8.3	<0.001	----	1.55	7.7
Waste Evaporator, Bldg. 2531 (MH 243)	2,800	0.129	12.5	1.70	8.5
Building 3525 (MH 135)	4.6	<0.001	----	0.82	4.1
Building 2026 (MH 240)	2.3	<0.001	----	1.21	6.0
Tank Farm Drainage	4,800	0.410	39.6	3.16	15.9

The activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HRLAL	2026	< 0.01	1
Central Radioactive Gas Disposal Facilities	3039	< 0.01	87
Radiochemical-Processing Pilot Plant	3020	< 0.01	5
MSRE	7512	< 0.01	1
HFIR and TRU	7911	< 0.01	15
Total Activity in Gases Released at X-10 Site		< 0.01	109
Tritium Target Fabrication Building		1 (³ H)	
Building 4508 Ventilation Discharges Room 136 Room 265			4.63 x 10 ⁻³ 1.05 x 10 ⁻³
Building 5505 Discharges Glove Box Hood			6.75 x 10 ⁻³ 1.16 x 10 ⁻¹

^a Activity primarily ¹³¹I except as noted.

^b These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

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CENTRAL FILES NUMBER

ORNL/CF-83/214

DATE: June 14, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF MARCH, 1983

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hamrin 7/15/86
Technical Information Officer Date
ORNL Site

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SUMMARY

The well salvage operation at the New Hydrofracture Facility was completed this month. A new hole was drilled from approximately 775 ft to 1,029 ft, and 1,010 ft of new Armco Nu-Lock 2 7/8-in. tubing were installed, pressure tested, and cemented in. A gunite sludge injection (GTSR No. 4) is scheduled for startup April 4.

Operation of the Waste Monitoring and Collection Systems for the month of March was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 229 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 86% of this total. The Industrial Safety and Applied Health Physics Division measured a 123 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of March was 0.7% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 39.9% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.123 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 81×10^4 and 17×10^4 m³, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 228 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.3 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 18.0 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	<u>^{90}Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	9.4	
190 Ponds	0.2	
Process Waste Treatment Plant	0.3	
Sewage Treatment Plant	18.0	
	<u>27.9</u>	
7500 Sampling Station	84.4	
Burial Grounds 1 and 3, and Floodplains		56.5
Station 3	158.1	
Burial Ground 4		73.7

Melton Branch

7900 Area (HFIR and TRU)	0.4	
7500 Area (NSPP and MSRE)	4.2	
	<u>4.6</u>	
Station 4	69.7	
Burial Ground 5		65.1

ILW Pit Disposal Area

East Weir	0.1	
West Weir	1.5	
	<u>1.6</u>	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	229.4	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		196.9
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		85.8

Process Waste

A total of $1.85 \times 10^4 \text{ m}^3$ of contaminated waste were chemically treated this month. Of this amount, $1.76 \times 10^4 \text{ m}^3$ were released to the Creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 28 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (h)	48	19	30
Volume treated (m^3)	829	409	661

On March 10 the treatment plant was shut down for a few hours in order to tie in the piping for new ion exchange column L-4D.

Intermediate Level Waste

The well recovery operations at the New Hydrofracture facility were completed during the reporting period. Drilling operations were terminated at a depth of 1,029 ft, and about two weeks later, 1,010 ft of Armco Nu-Lock 2 7/8-in. tubing were run into the hole as follows. After inspection and thread tube application, the joints were machine torqued to 2,000 ft-lb. Each joint was then pressure tested to 5,000 psi using equipment and procedures provided by Hydro-Test, Inc. of Pearland, Texas. All of the assembly operations were witnessed and attested by ORNL QA and I personnel.

The well was partially cemented in on March 17, by Halliburton Services using standard procedures and materials: Class A cement with 10% wt salt and 0.4% Halad additives, at a ratio of 15.8 lb/gal. A total of 588 gal of slurry had been pumped down the hole when the annulus bridged over with debris and "dead headed" the system. Subsequent efforts to break the plug were not successful - reverse circulation was impossible because the bottom of the string was equipped with a float shoe (check valve). About 760 ft of annular space were cemented in together with the tubing string. The cement was drilled from the string in four days, using a 2 1/4-in. drill bit and a 1 1/4-in. drill pipe. The well assembly is now ready for slotting and the subsequent completion of GTSR No. 4.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.44 m³/h.

The summary of storage operations is given below.

	<u>m³</u>
Total volume generated	290.0
Volume transferred to evaporators	328.4
South Tank Farm Inventory:	
Beginning of Month	1,000.1
End of Month	1,092.6
Service Tank Inventory:	
W-21, Beginning of Month	27.4
W-21, End of Month	16.9
W-22, Beginning of Month	56.6
W-22, End of Month	28.7
W-23, Beginning of Month	101.9
W-23, End of Month	119.9
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	1,011.6
Total Volume at End of Month	1,248.5

The cleaning out of gunite tank W-5 was resumed during the month of March. Approximately 174 m³ of solution containing resuspended sludge from W-5 were transferred to the Melton Valley Waste Storage Facility.

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>$\frac{3}{m}$</u>
Transuranium Processing Area	9.5
Building 3019	14.3
Building 3525	13.3
Radioisotopes Processing Area	31.9
ORR and BSR	6.4
High Flux Isotope Reactor	38.4
Fission Products Development Laboratory	17.1*
4500 Complex	49.5
Building 3544	23.9

Gaseous Waste

The ORNL Stacks discharged <2 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was <182 μCi . Inert gases released from the 3039 and 7911 Stacks averaged less than 0.9% and 0.7% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3: the total releases are compared on a monthly basis in Fig. 7. Demolition of existing equipment in the 3039 stack area continued during the month of March.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

ORNL-DWG 83C-11098

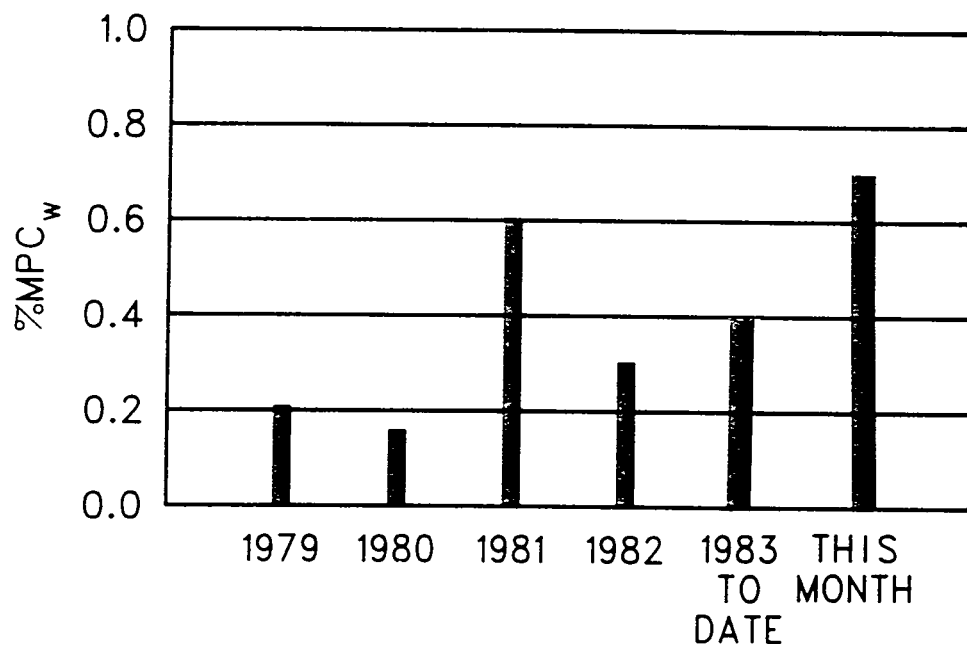


Fig.1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges*(ISAHP Measurements at White Oak Dam).

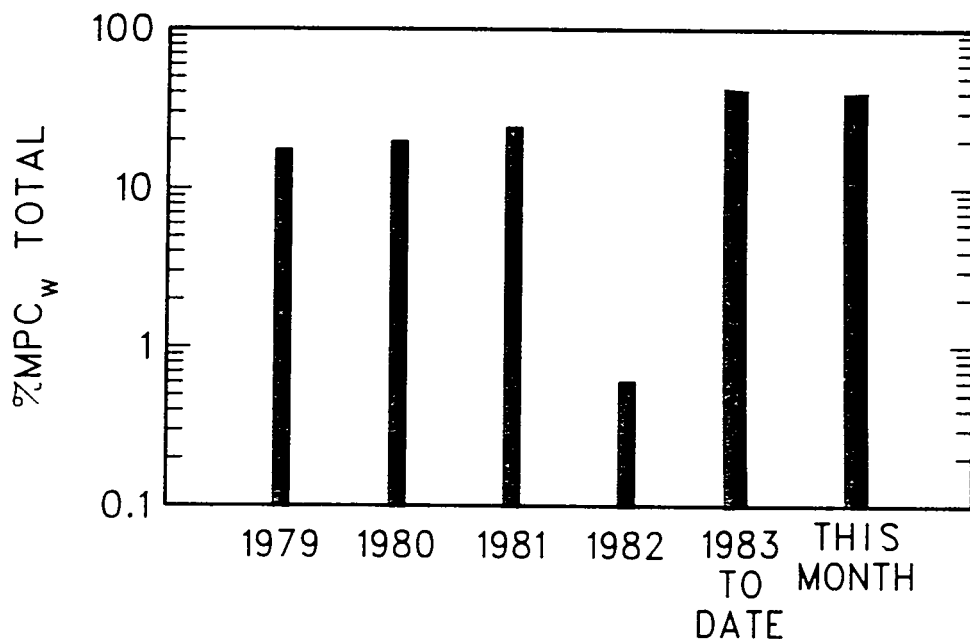


Fig.1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

*Tests show that complete mixing does not occur in the near reaches of the river.

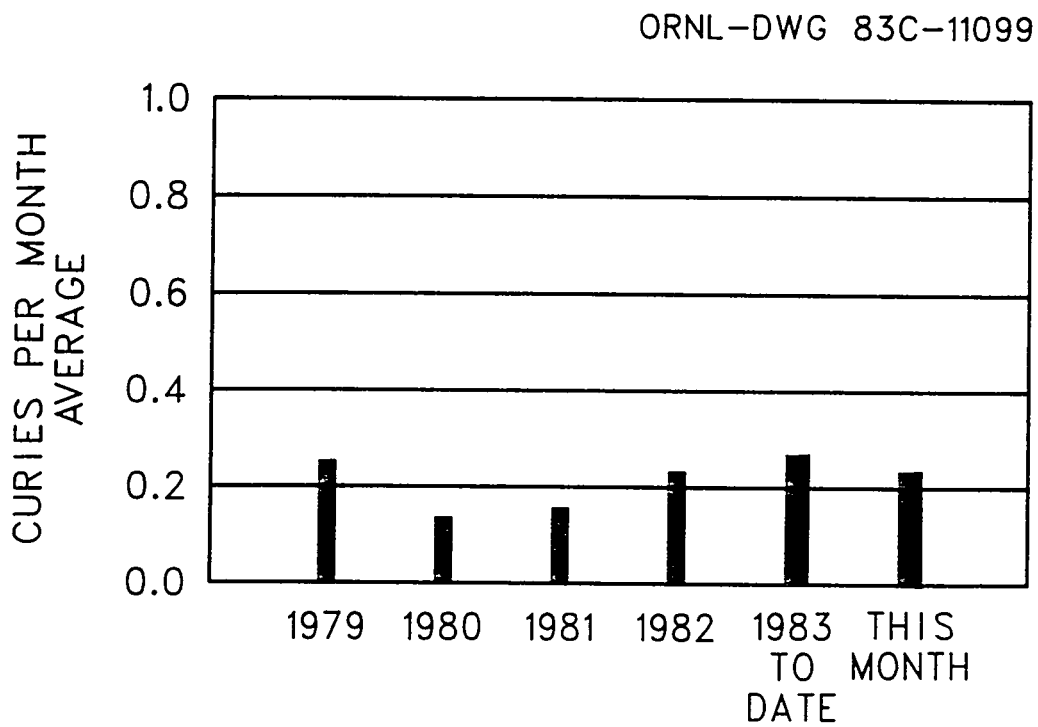


Fig.2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7)

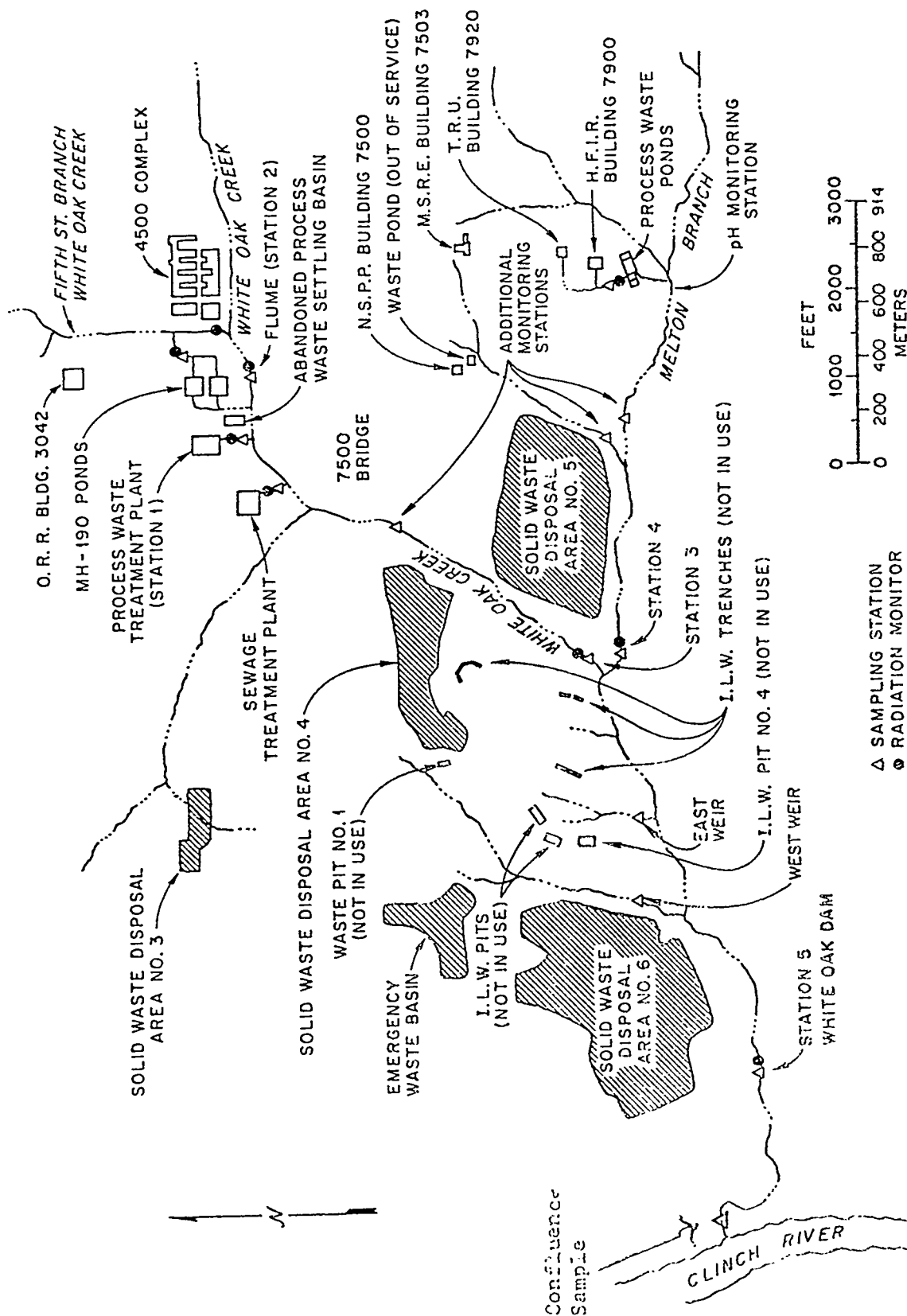


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

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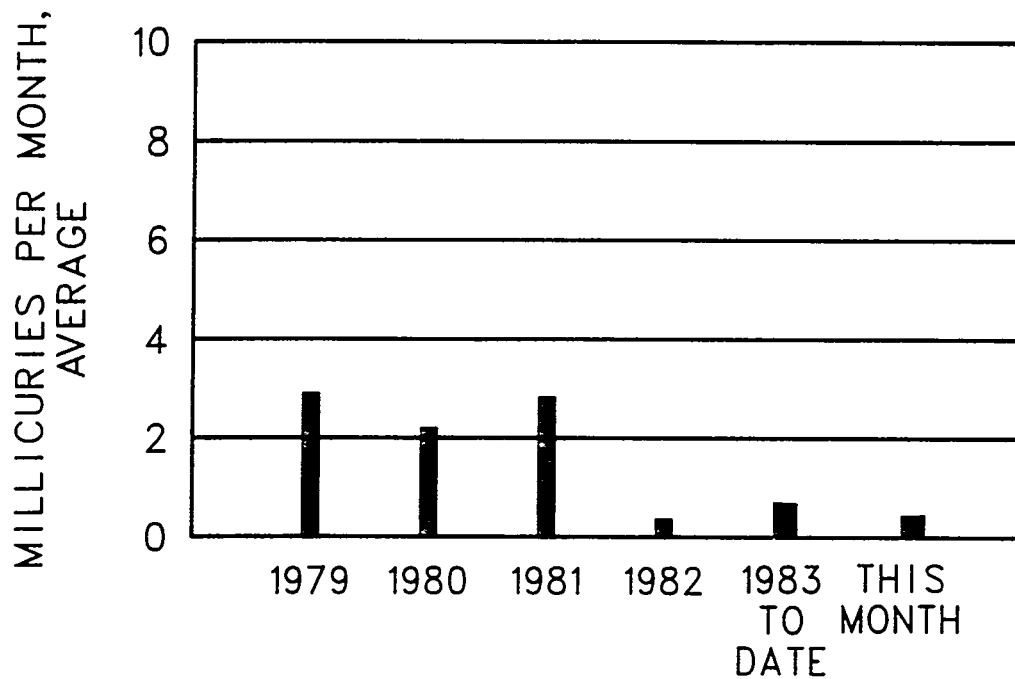
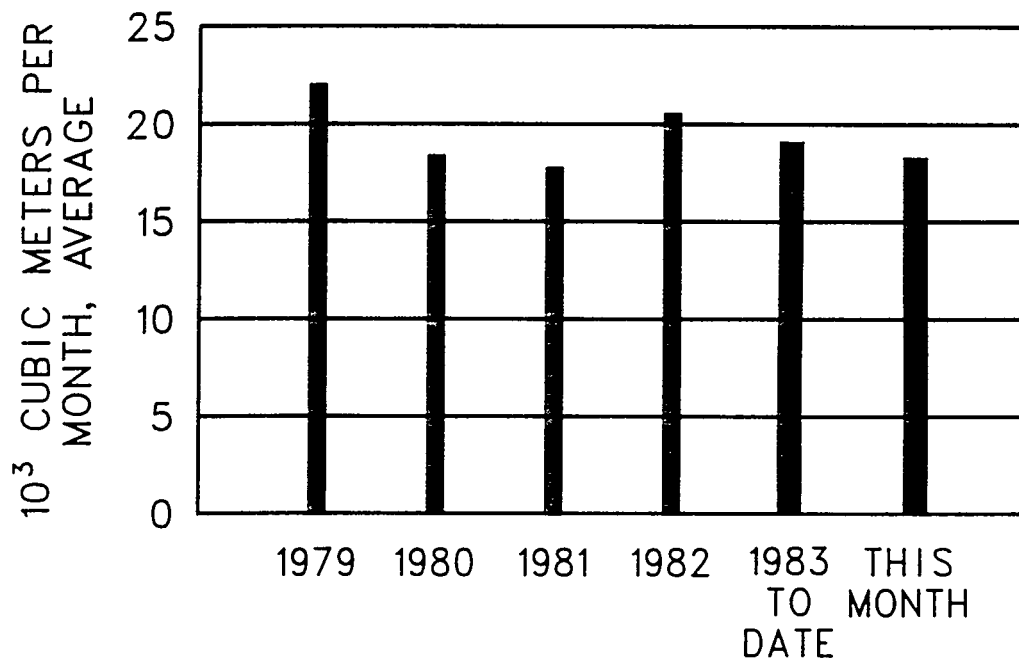
Fig. 4. ^{90}Sr Discharge in Waste to White Oak Creek

Fig. 5. Process Waste Volumes.

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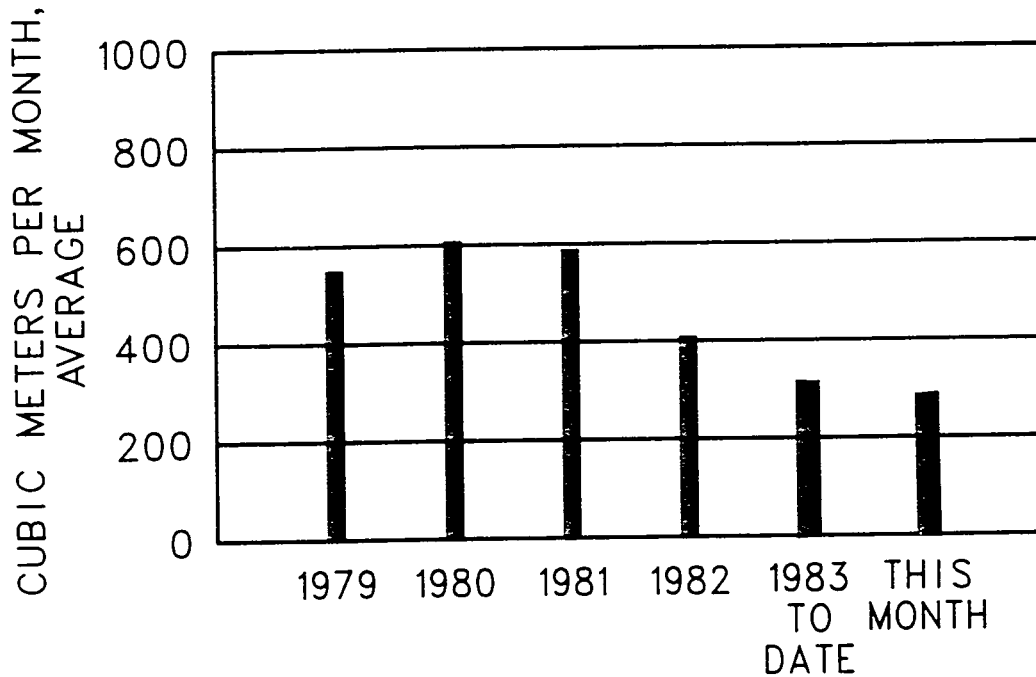


Fig.6. Intermediate-Level Waste Volumes.

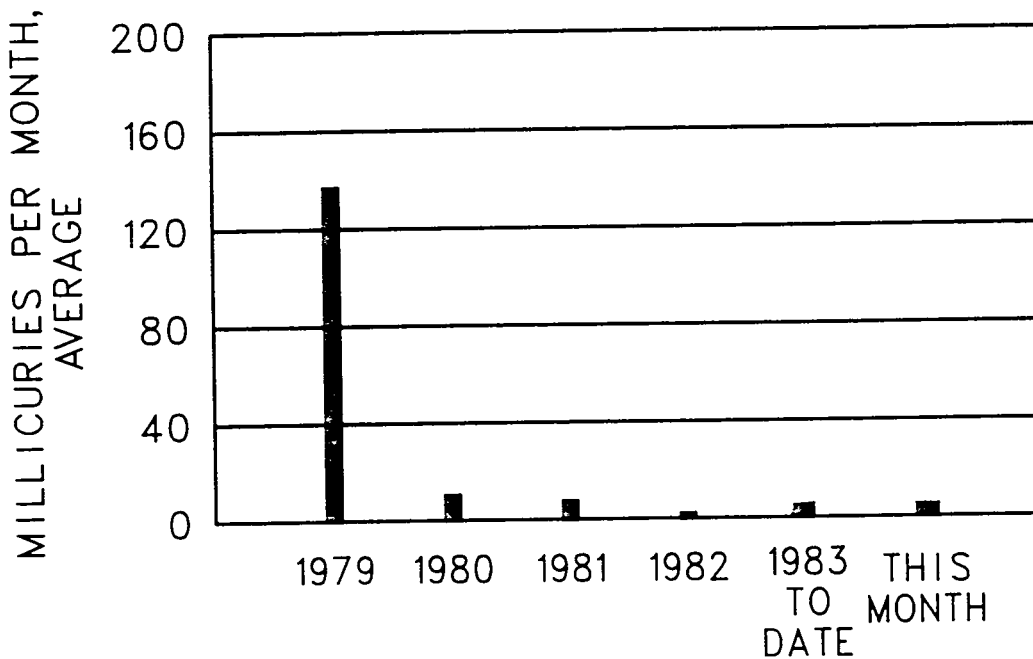


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.1581	0.549
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0697	0.181
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0015	
Total discharge from all sources		0.2294	0.730
White Oak Dam to Clinch River (ISAHP Measurement)		0.123	0.337

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	3900	0.456	35.1	4.34	17.3
Radioisotopes Processing Area (MH114 minus MH112)	----	0.309 ^a	23.8	1.69	6.8
Reactor Operations (MH112)	8.2	0.001	0.14	5.96	23.8
Buildings 3503 and 3508 (MH 229)	0.57	<0.001	----	2.30	9.2
Buildings 3025 and 3026 (MH 149)	15	<0.001	----	1.24	5.0
Building 3019 (MH 25)	3.6	<0.001	----	2.26	9.0
Waste Evaporator, Bldg. 2531 (MH 243)	3300	0.150	11.5	1.69	6.8
Building 3525 (MH 135)	2	<0.001	----	0.68	2.7
Building 2026 (MH 240)	0.6	<0.001	----	1.63	6.5
Tank Farm Drainage	4400	0.384	29.5	3.24	12.9

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (Ci)
HLAL	2026	< 0.01	1
Central Radioactive Gas Disposal Facilities	3039	< 0.01	131
Radiochemical-Processing Pilot Plant	3020	< 0.01	35
MSRE	7512	< 0.01	1
HFIR and TRU	7911	< 0.01	14
Total Activity in Gases Released at X-10 Site		< 0.01	182
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		0.2 (³ H)	
Building 4508 Ventilation Discharges Room 136 Room 265			4.63x10 ⁻³ 1.05x10 ⁻³
Building 5505 Discharges Glove Box Hood			6.75x10 ⁻³ 1.16x10 ⁻¹

^a Activity primarily ¹³¹I except as noted.

^b These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^c No data available at this time.

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ORNL

CENTRAL FILES NUMBER

ORNL CF-83/242

DATE: June 23, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF APRIL 1983

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release
to the public by:

Dennis H. H. H. 7/15/96
Technical Information Officer Date
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SUMMARY

Gunite sludge injection GTSR 4 was completed April 10, 1983, and the sluicing of sludge from gunite tank W-5 continued through the period.

Operation of the Waste Monitoring and Collection Systems for the month of April was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 271 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 72% of this total. The Industrial Safety and Applied Health Physics Division measured a 254 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of March was 0.9% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 49.9% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.254 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 100×10^4 and $31 \times 10^4 \text{ m}^3$, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 271 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.4 mCi of ^{90}Sr was released by the Process Waste Treatment Plant; 0.1 mCi of ^{90}Sr was released from the 190 pond system; a total of 22.5 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	By Measurement	By Difference
Flume	13.5	
190 Ponds	0.1	
Process Waste Treatment Plant	0.4	
Sewage Treatment Plant	22.5	
	<u>36.5</u>	
7500 Sampling Station	99.1	
Burial Grounds 1 and 3, and Floodplains		62.6
Station 3	167.9	
Burial Ground 4		68.8

Melton Branch

7900 Area (HFIR and TRU)	31.8	
7500 Area (NSPP and MSRE)	7.9	
	<u>39.7</u>	
Station 4	93.0	
Burial Ground 5		53.3

ILW Pit Disposal Area

East Weir	0.1	
West Weir	9.6	
	<u>9.7</u>	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	270.6	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		194.4
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		71.8

Process Waste

A total of $1.99 \times 10^4 \text{ m}^3$ of contaminated waste were chemically treated this month. Of this amount, $1.73 \times 10^4 \text{ m}^3$ were released to the Creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 33 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (h)	34.5	17.5	31
Volume treated (m^3)	750	372	587

Intermediate Level Waste

The scheduled injection of GTSR 4 was completed during the period. Site preparations included running of a Cement Bond Log, perforating and severing the tubing with explosives, and subsequently fracturing the shale formation by pressurization. A total of 197,000 gal of suspended sludge was slurried with 1,100,000 lb of blended cement and fly ash and pumped into the formation at a depth of 1,010 ft. Sludge injection GTSR 5 is scheduled for May 16, 1983.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was $0.41 \text{ m}^3/\text{h}$.

The summary of storage operations is given below.

	<u>m^3</u>
Total volume generated	313.4
Volume transferred to evaporators	296.3
South Tank Farm Inventory:	
Beginning of Month	1,092.6
End of Month	1,117.5
Service Tank Inventory:	
W-21, Beginning of Month	16.9
W-21, End of Month	37.5
W-22, Beginning of Month	28.7
W-22, End of Month	25.2
W-23, Beginning of Month	119.9
W-23, End of Month	143.6
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	1,248.5
Total Volume at End of Month	817.3

The cleaning out of gunite tank W-5 was resumed during the month of April. Approximately 217.9 m^3 of solution containing resuspended sludge from W-5 were transferred to the Melton Valley Waste Storage Facility.

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	3.5
Building 3019	29.7
Building 3525	16.3
Radioisotopes Processing Area	30.1
ORR and BSR	29.0
High Flux Isotope Reactor	23.3
Fission Products Development Laboratory	31.4*
4500 Complex	28.8
Building 3544	28.0

Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was 152 µCi. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.5% and 1.2% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3: the total releases are compared on a monthly basis in Fig. 7. Demolition of existing equipment in the 3039 stack area continued during the month of April.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

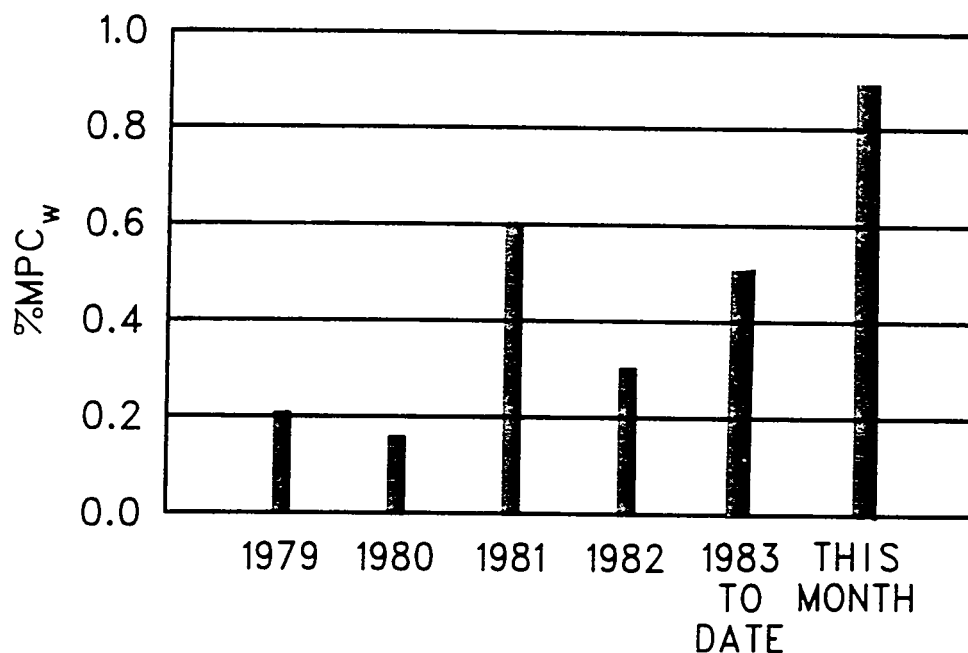


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (ISAHP Measurements at White Oak Dam).

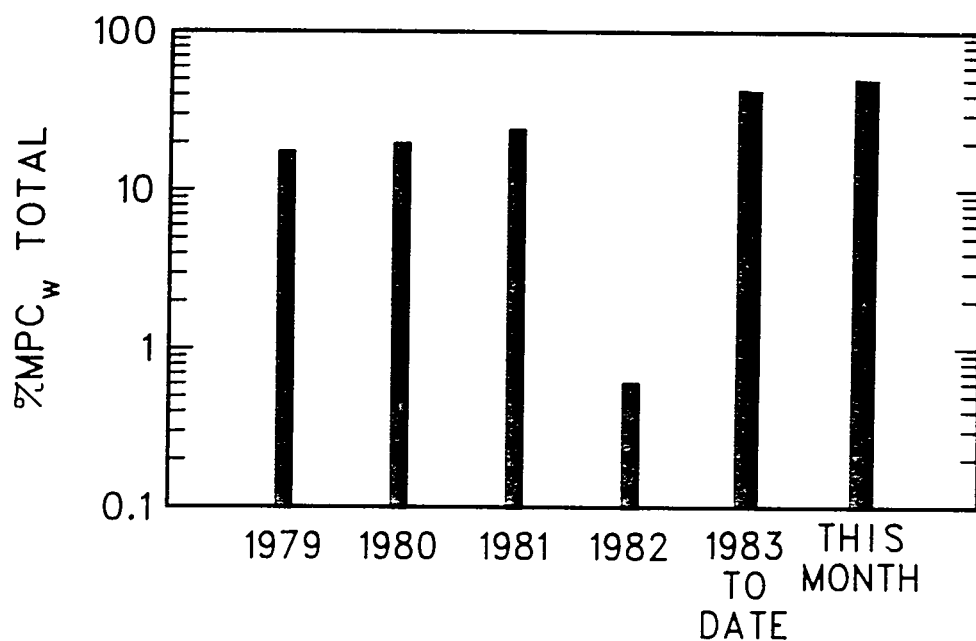


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

* Tests show that complete mixing does not occur in the near reaches of the river.

ORNL-DWG 83C-11099

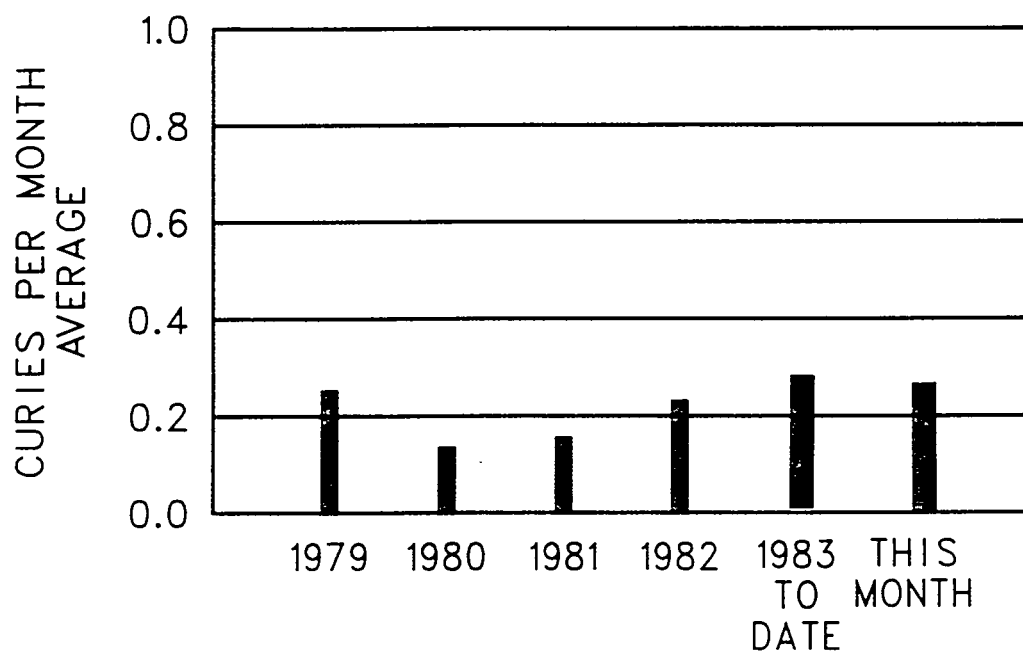
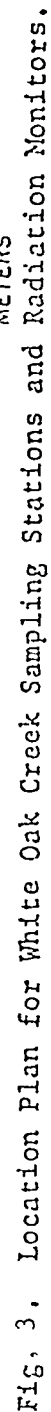


Fig.2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7)



ORNL-DWG 83C-11100

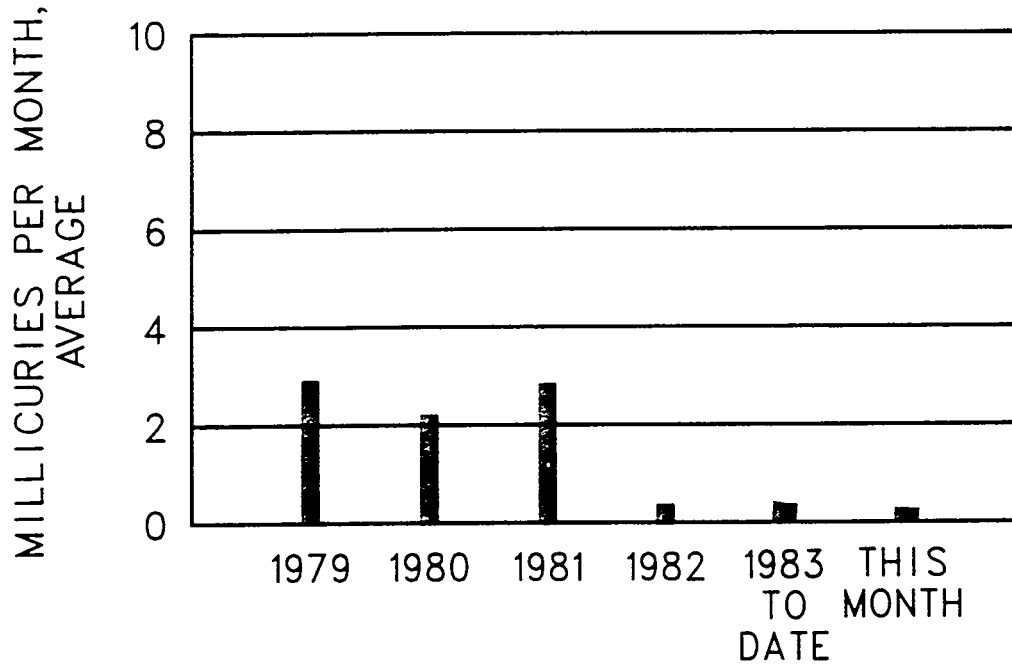
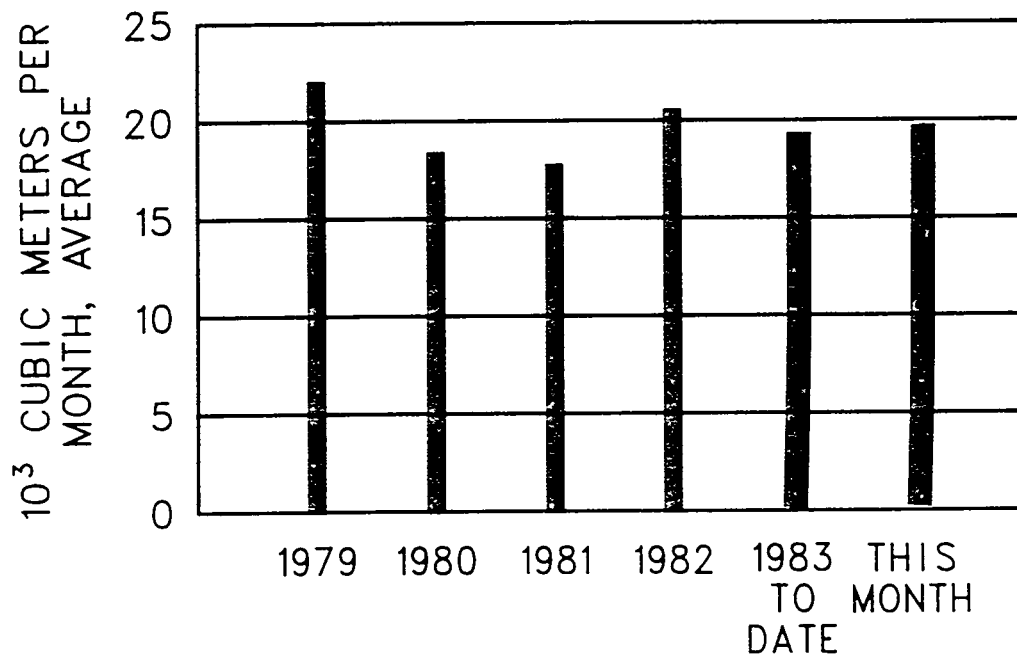
Fig.4. ^{90}Sr Discharge in Waste to White Oak Creek

Fig.5. Process Waste Volumes.

ORNL-DWG 83C-11101

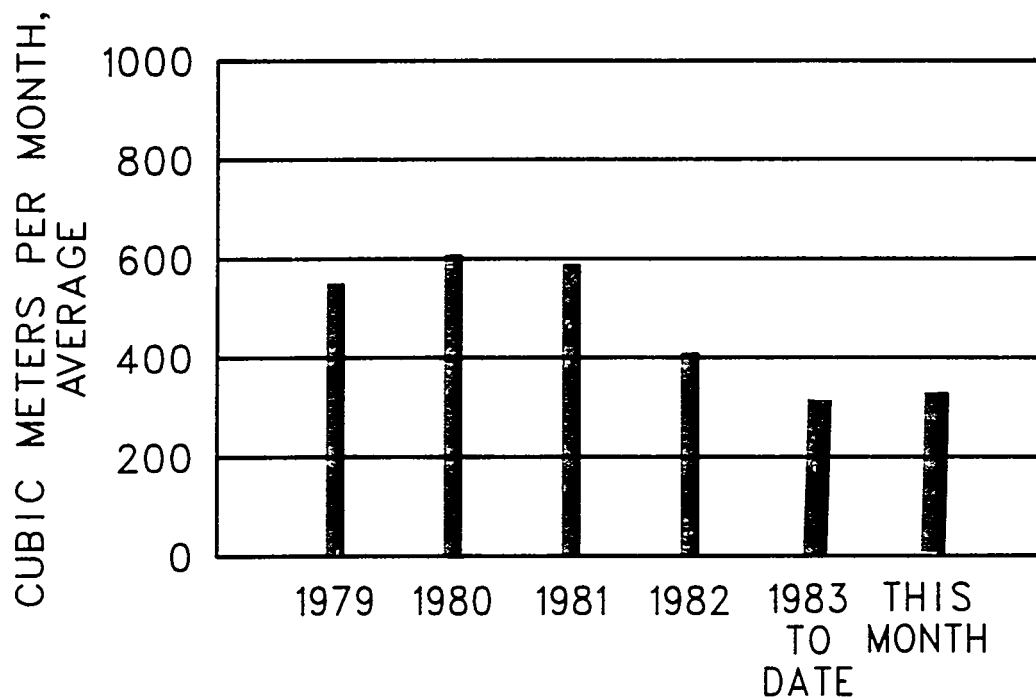


Fig.6. Intermediate-Level Waste Volumes.

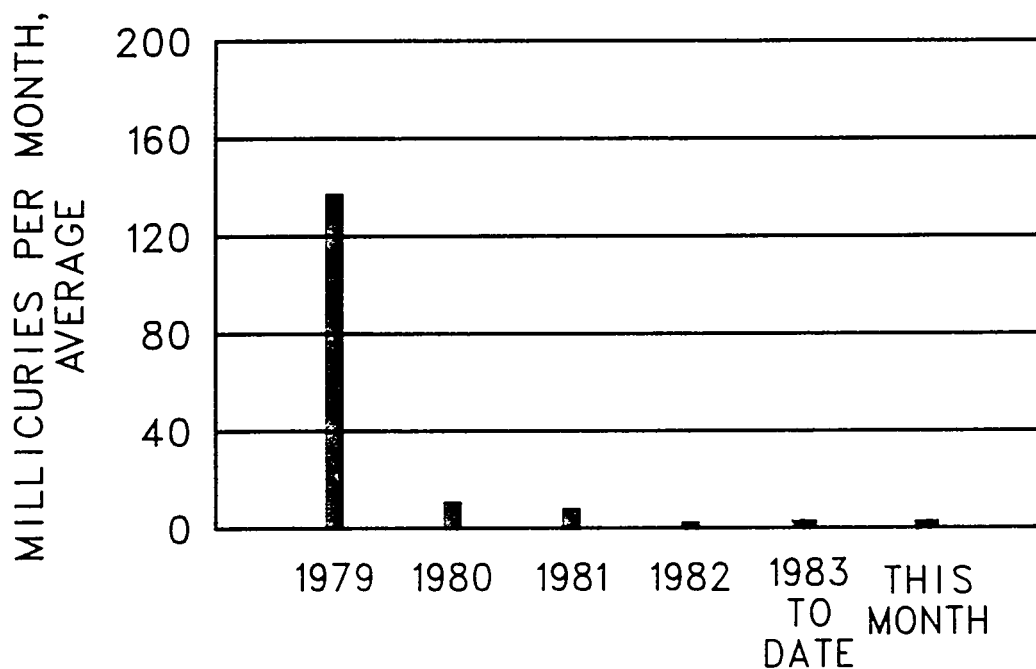


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.1679	0.7041
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0930	0.2199
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0096	
Total discharge from all sources		0.2706	0.9240
White Oak Dam to Clinch River (ISAHP Measurement)		0.2540	0.5180

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/l	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	2500	0.209	26.9	3.10	16.0
Radioisotopes Processing Area (MH114 minus MH112)	---	0.197 ^a	25.3	1.73	8.9
Reactor Operations (MH112)	2.4	0.003	0.4	3.97	20.5
Buildings 3503 and 3508 (MH 229)	0.62	<0.001	---	1.31	6.8
Buildings 3025 and 3026 (MH 149)	39	<0.001	---	0.92	4.8
Building 3019 (MH 25)	7.2	<0.001	---	1.78	9.2
Waste Evaporator, Bldg. 2531 (MH 243)	1100	0.041	5.3	1.40	7.2
Building 3525 (MH 235)	6.3	<0.001	---	0.61	3.2
Building 2026 (MH 240)	0.86	<0.001	---	1.40	7.2
Tank Farm Drainage	3900	0.327	42.1	3.11	16.2

^a The activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HRLAL	2026	< 0.01	1
Central Radioactive Gas Disposal Facilities	3039	< 0.01	137
Radiochemical-Processing Pilot Plant	3020	< 0.01	10
MSRE	7512	< 0.01	1
HFIR and TRU	7911	< 0.01	5
Total Activity in Gases Released at X-10 Site		< 0.01	152
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		(c) (^3H)	4600
Building 4508 Ventilation Discharges Room 136 Room 265			6.17×10^{-3} 1.40×10^{-3}
Building 5505 Discharges Glove Box Hood			9.00×10^{-3} 1.55×10^{-1}

^a Activity primarily ^{131}I except as noted.

^b These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^c No data available at this time.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-83/266

DATE: August 9, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF May 1983

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hamner 7/15/96
Technical Information Officer Date
ORNL Site

Internal Use Only

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SUMMARY

Gunite sludge injection SI-5 was completed May 18, 1983. The sluicing of sludge from gunite tank W-5 was completed on May 10, 1983. Approximately 12 m³ of a crystalline phosphate material were left in the tank. The relocation of sluicing equipment from W-5 to W-6 is currently in progress.

Operation of the Waste Monitoring and Collection Systems for the month of May was routine. The total amount of ⁹⁰Sr discharged into White Oak Lake from ORNL sources was 292 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 90% of this total. The Industrial Safety and Applied Health Physics Division measured a 257mCi release of ⁹⁰Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ¹³¹I; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of May was 0.4% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 30.7% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.257 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 108×10^4 and $37 \times 10^4 \text{ m}^3$, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 323 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.4 mCi of ⁹⁰Sr was released from the 190 pond system; a total of 14.5 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	<u>^{90}Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	6.9	
190 Ponds	0.4	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	14.6	
	<u>22.1</u>	
7500 Sampling Station	73.5	
Burial Grounds 1 and 3, and Floodplains		51.4
Station 3	172.9	
Burial Ground 4		99.4

Melton Branch

7900 Area (HFIR and TRU)	2.8	
7500 Area (NSPP and MSRE)	7.0	
	<u>9.8</u>	
Station 4	150.5	
Burial Ground 5		140.7

ILW Pit Disposal Area

East Weir	0.1	
West Weir	6.4	
	<u>6.5</u>	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	329.9	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		298.0
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		90.3

Process Waste

A total of $1.88 \times 10^4 \text{ m}^3$ of contaminated waste were chemically treated this month. Of this amount, $1.83 \times 10^4 \text{ m}^3$ were released to the Creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 28 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (h)	37	23.5	31
Volume treated (m^3)	830	490	671

Intermediate Level Waste

The scheduled gunite sludge injection SI-5 was completed May 18, 1983. A total of 159,000 gal of suspended sludge was slurried with 992,000 lbs of blended cement and fly ash and pumped into the formation at a depth of 1,010 ft. Injection ILW No. 20 is scheduled for June 13, 1983.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.34 m³/h.

The summary of storage operations is given below.

	<u>m³</u>
Total volume generated	276.5
Volume transferred to evaporators	255.2
South Tank Farm Inventory:	
Beginning of Month	1,117.5
End of Month	899.0
Service Tank Inventory:	
W-21, Beginning of Month	37.5
W-21, End of Month	45.4
W-22, Beginning of Month	25.2
W-22, End of Month	38.6
W-23, Beginning of Month	143.6
W-23, End of Month	37.5
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	817.3
Total Volume at End of Month	1,005.0

The cleaning out of gunite tank W-5 was finished on May 10, 1983. Approximately 432 m³ of solution containing resuspended sludge from W-5 were transferred to the Melton Valley Waste Storage Facility in May. Preparations for the sluicing of tank W-6 continued through the remainder of the reporting period.

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	9.9
Building 3019	17.3
Building 3525	4.5
Radioisotopes Processing Area	19.8
ORR and BSR	46.3
High Flux Isotope Reactor	26.7
Fission Products Development Laboratory	30.6*
4500 Complex	12.3
Building 3544	42.9

Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was 168 μCi. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.3% and 1.1% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3: the total releases are compared on a monthly basis in Fig. 7.

*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

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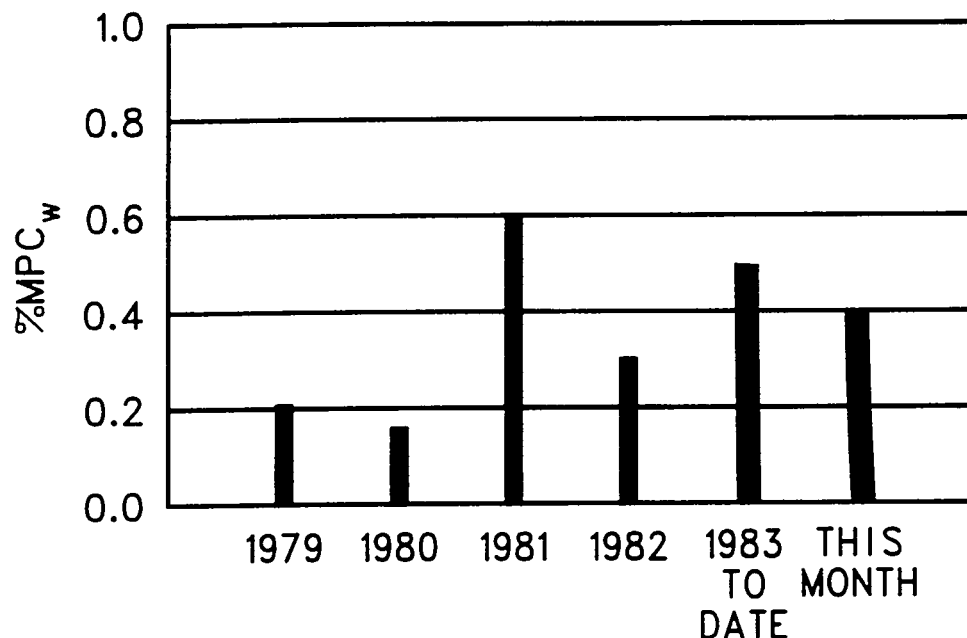


Fig.1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges*(ISAHP Measurements at White Oak Dam).

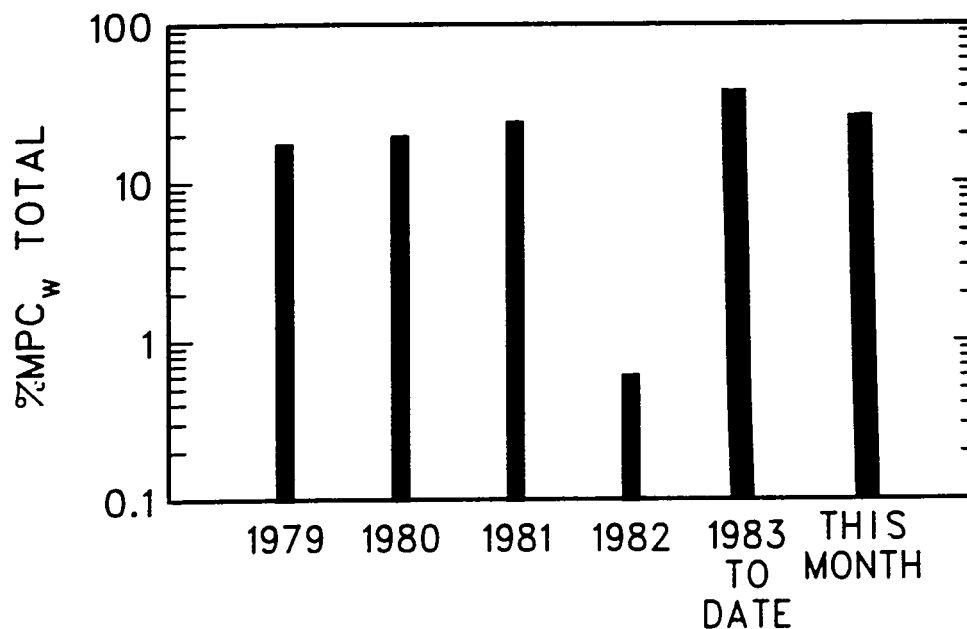


Fig.1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

*Tests show that complete mixing does not occur in the near reaches of the river.

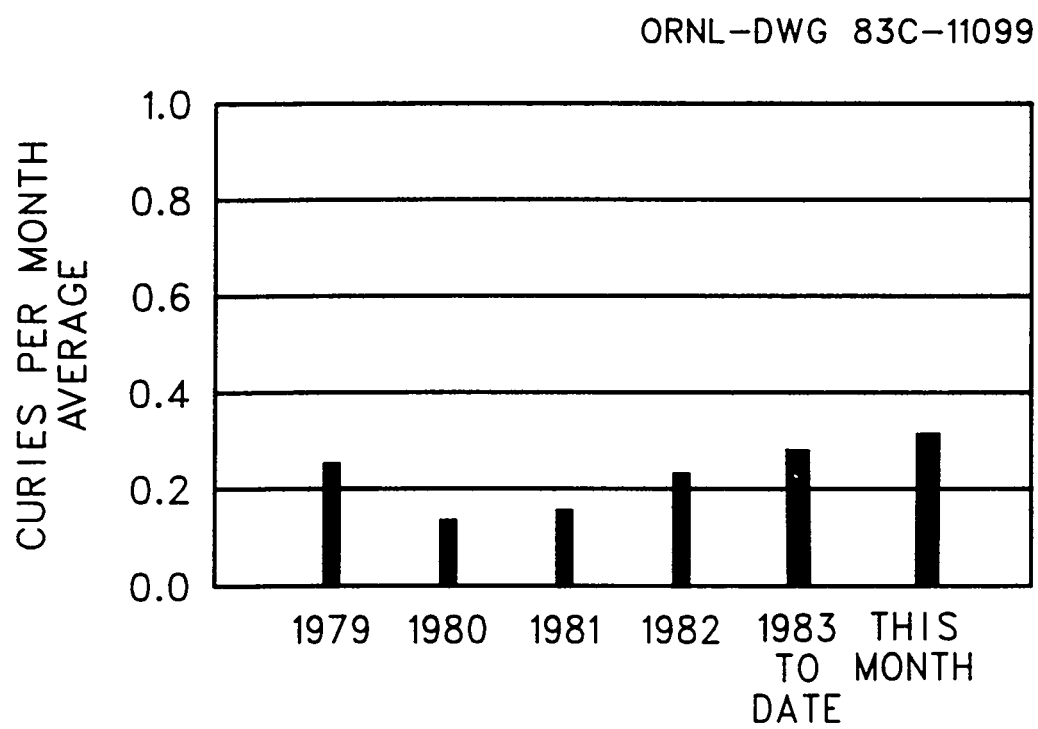


Fig.2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7)

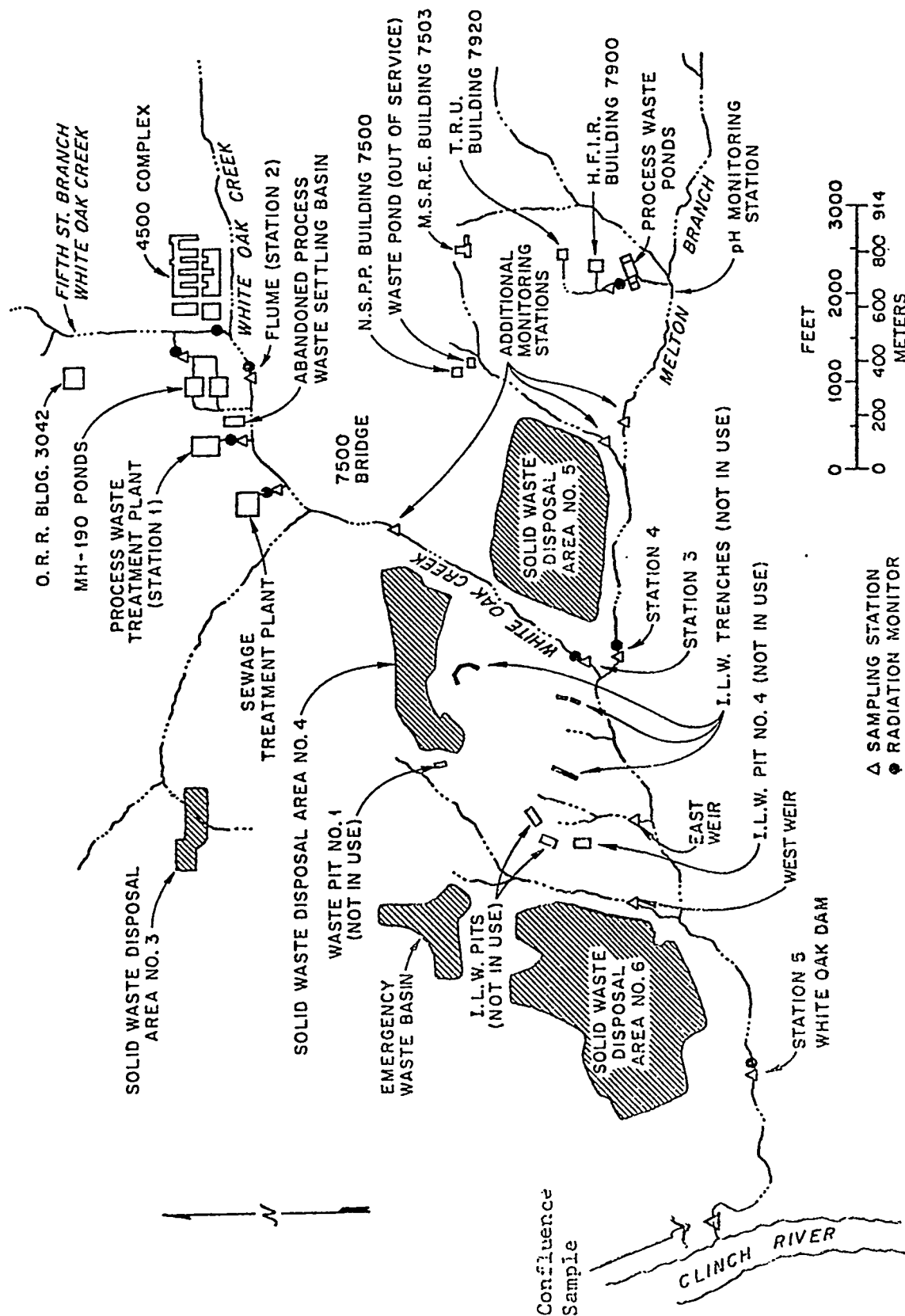


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

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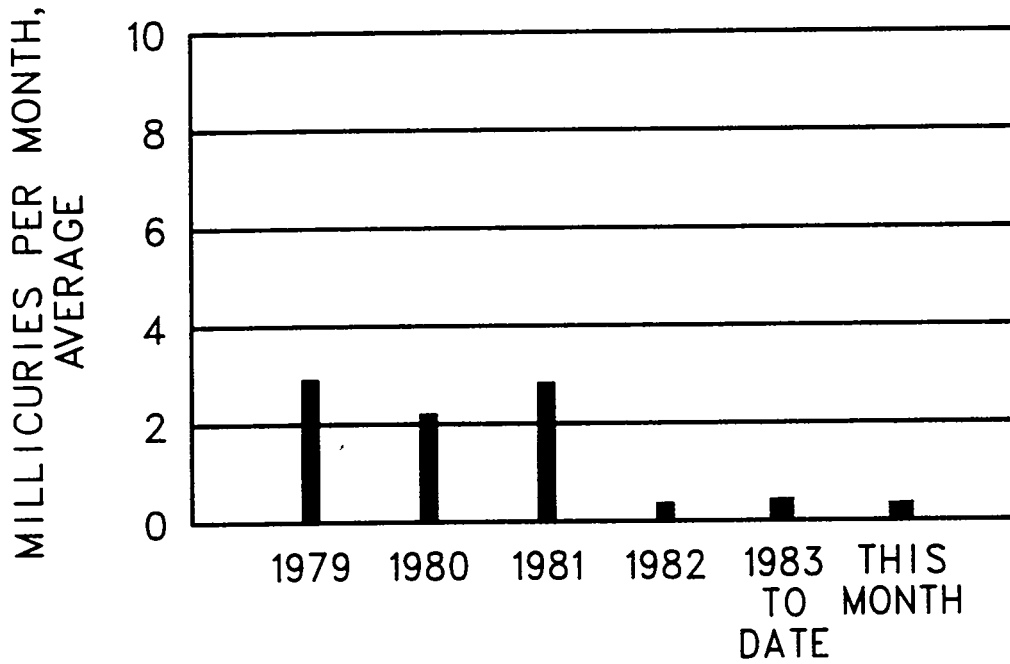
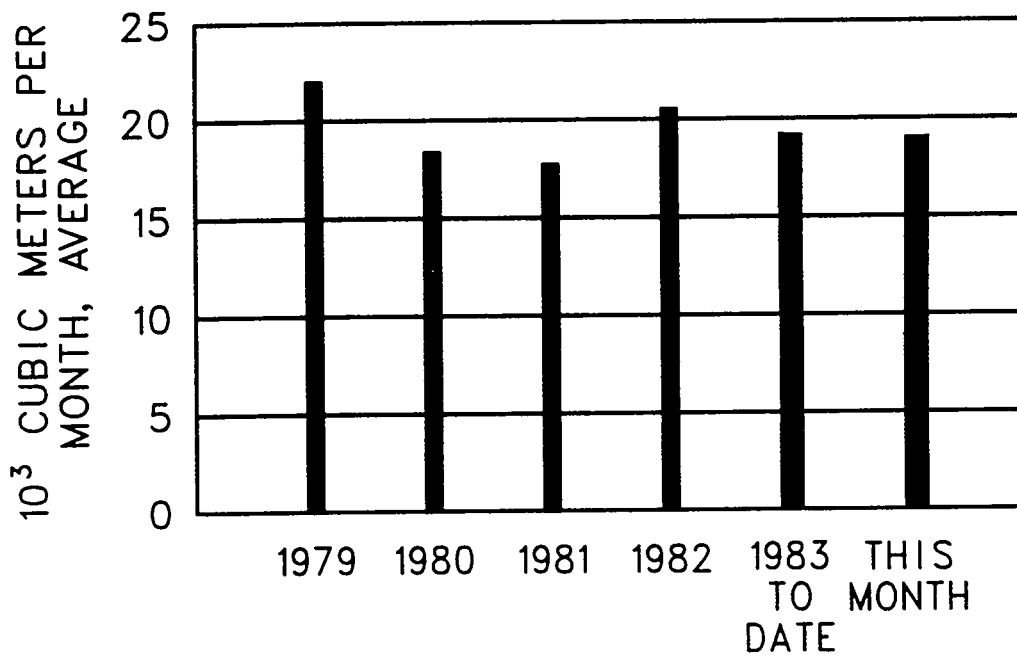
Fig.4 ^{90}Sr Discharge in Waste to White Oak Creek

Fig.5. Process Waste Volumes.

ORNL-DWG 83C-11101

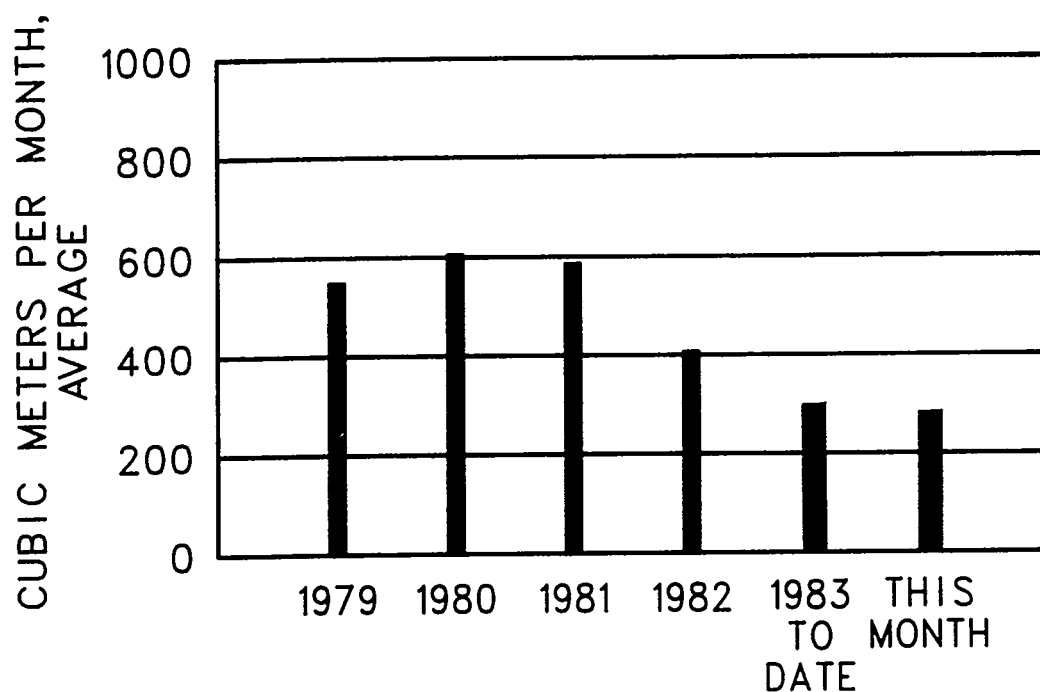


Fig.6. Intermediate-Level Waste Volumes.

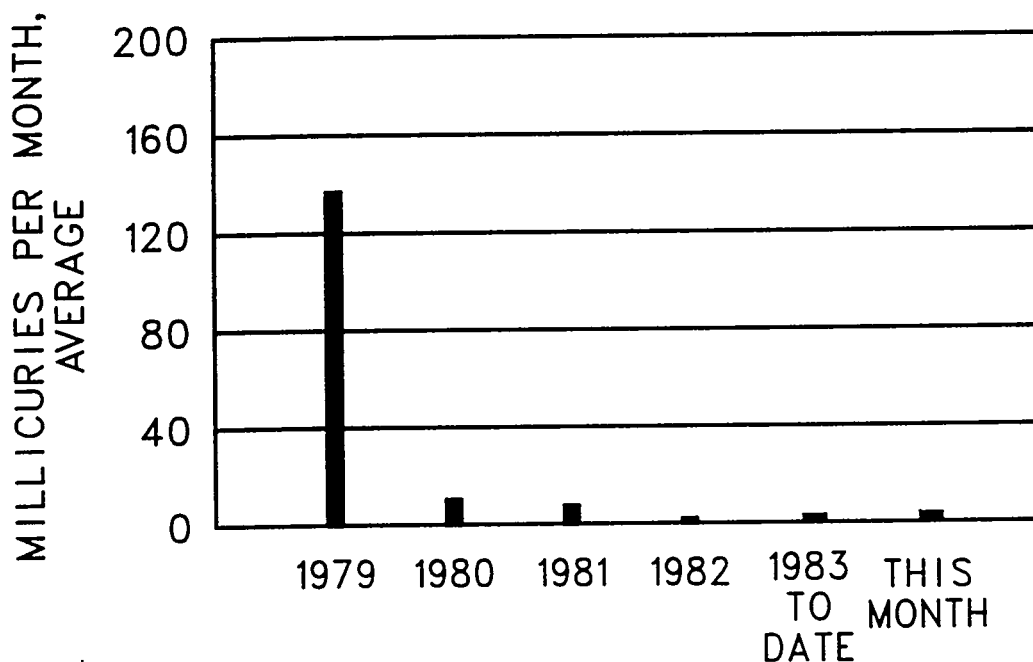


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.1729	0.4982
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.1505	0.3311
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0064	-----
Total discharge from all sources		0.3299	0.8293
White Oak Dam to Clinch River (ISAHP Measurements)		0.257	0.752

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ^{90}Sr .

Table 2. Process-Waste Discharges

	^{90}Sr Bq/l	Cl	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	1800	0.215	23.0	4.43	16.0
Radioisotopes Processing Area (MH114 minus MH112)	---	0.308 ^a	32.9	10.9	8.9
Reactor Operations (MH112)	19	0.003	0.3	5.06	21.1
Buildings 3503 and 3508 (MH 229)	0.80	<0.001	---	1.13	4.7
Buildings 3025 and 3026 (MH 149)	20	<0.001	---	1.27	5.3
Building 3019 (MH 25)	7.4	<0.001	---	1.86	7.8
Waste Evaporator, Bldg. 2531 (MH 243)	1200	0.066	7.0	2.05	8.6
Building 3525 (MH 235)	3.2	<0.001	---	0.60	2.5
Building 2026 (MH 240)	3.2	<0.001	---	1.29	5.4
Tank Farm Drainage	3500	0.345	36.8	3.65	15.2

^a The activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	< 0.01	2
Central Radioactive Gas Disposal Facilities	3039	< 0.01	92
Radiochemical-Processing Pilot Plant	3020	< 0.01	62
MSRE	7512	< 0.01	1
HFIR and TRU	7911	< 0.01	11
Total Activity in Gases Released at X-10 Site		< 0.01	168
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		940 (³ H)	----
Building 4508 Ventilation Discharges Room 136 Room 265			5.41x10 ⁻³ 1.22x10 ⁻³
Building 5505 Discharges Glove Box Hood			7.88x10 ⁻³ 1.36x10 ⁻¹

^a Activity primarily ¹³¹I except as noted.

^b These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^c No data available at this time.

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CENTRAL FILES NUMBER

ORNL/CF-83/267

DATE: September 2, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF June 1983.

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsor: J. H. Swanks²⁷

This document has been approved for release
to the public by:

David R. Hamlin 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Intermediate level waste injection ILW-20 was completed June 13, 1983, and the sluicing of sludge from gunite tank W-6 began on June 1, 1983.

Operation of the Waste Monitoring and Collection Systems for the month of June was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 146 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 84% of this total. The Industrial Safety and Applied Health Physics Division measured a 123 mCi release of ^{90}Sr at the White Oak Dam sample station ($0.1\% \text{ MPC}_W$ in the Clinch River for recorded flows). The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of June was 0.1% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 16.1% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.123 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 60×10^4 and 19×10^4 m³, respectively. Fig. 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Ground 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 146 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; and a total of 22.6 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	5.9	
190 Ponds	0.2	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>16.3</u>	
	22.6	
7500 Sampling Station	(1)	
Station 3	86.8	
Burial Grounds 1, 3, 4, and Floodplains		64.2

Melton Branch

7900 Area (HFIR and TRU)	0.2	
7500 Area (NSPP and MSRE)	<u>1.0</u>	
	1.2	
Station 4	59.4	
Burial Ground 5		58.2

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>0.1</u>	
	0.2	

Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	146.4	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		122.6
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		83.7%

- (1) The measured value at this station for the period was 208 mCi which is not consistent with downstream measurements or Station 3 (87 mCi) and a total release over White Oak Dam of 123 mCi. The suspected error is attributed to cross contamination during sample handling.

Process Waste

About $1.56 \times 10^4 \text{ m}^3$ of process waste were treated by ion exchange and released to White Oak Creek.

The strontium activity released from the process waste system to White Oak Creek compared to previous months is shown in Fig. 4; the waste volume processed compared to previous months is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 27 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	39	22.5	30
Volume treated (m^3)	790	470	579

Intermediate Level Waste

The scheduled injection of ILW-20 was completed on June 13, 1983. A total of 434 m^3 (114,750 gal) of intermediate level waste was slurried with 337,000 kg (743,000 lb) of blended cement and fly ash and pumped into the formation at a depth of 1,010 ft. Sludge injection GTSR 6 is scheduled for July 11, 1983.

The sluicing of gunite tank W-6 began on June 1, 1983. During the reporting period, 500.9 m^3 (132,000 gal) of resuspended sludge were transferred to the hydrofracture site for future disposal.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.56 m³/h.

The summary of storage operations is given below.

	<u>m³</u>
Total volume generated	382.4
Volume transferred to evaporators	416.3
South Tank Farm Inventory:	
Beginning of Month	899.0
End of Month	753.3
Service Tank Inventory:	
W-21, Beginning of Month	45.4
W-21, End of Month	25.8
W-22, Beginning of Month	38.6
W-22, End of Month	24.3
W-23, Beginning of Month	37.5
W-23, End of Month	72.4
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	1,005.0
Total Volume at End of Month	1,042.0

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>3 m</u>
Transuranium Processing Area	14.2
Building 3019	7.1
Building 3525	9.8
Radioisotopes Processing Area	14.9
ORR and BSR	38.0
High Flux Isotope Reactor	50.2
Fission Products Development Laboratory	11.0*
4500 Complex	17.1
Building 3544	24.6

Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was 109 μCi . Inert gases released from the 3039 and 7911 Stacks averaged less than 1.2% and 2.1% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

*The storage tank pit has an inleakage problem from groundwater and, this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

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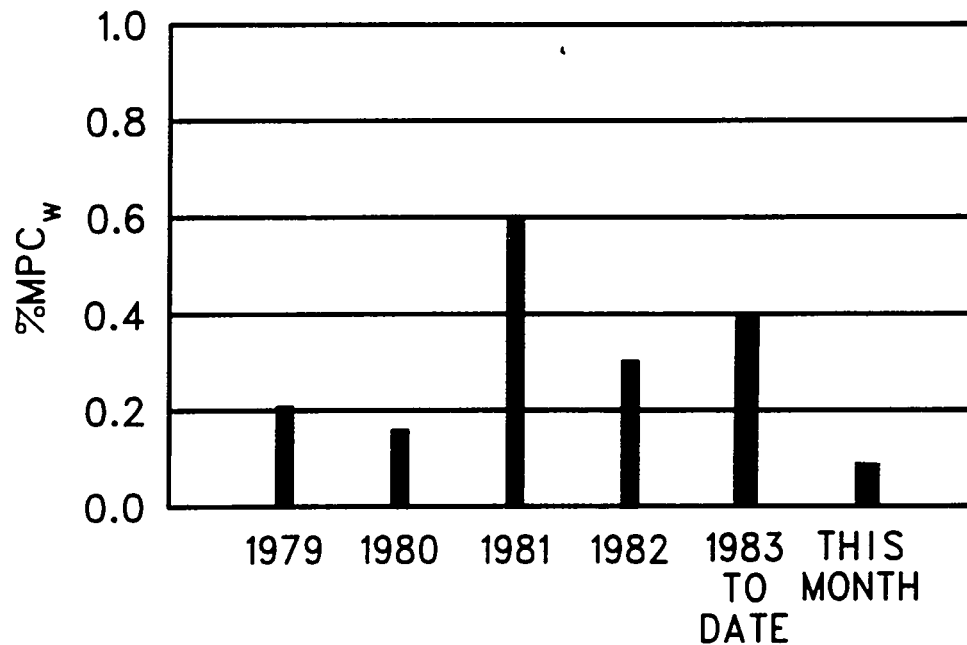


Fig.1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges*(ISAHP Measurements at White Oak Dam).

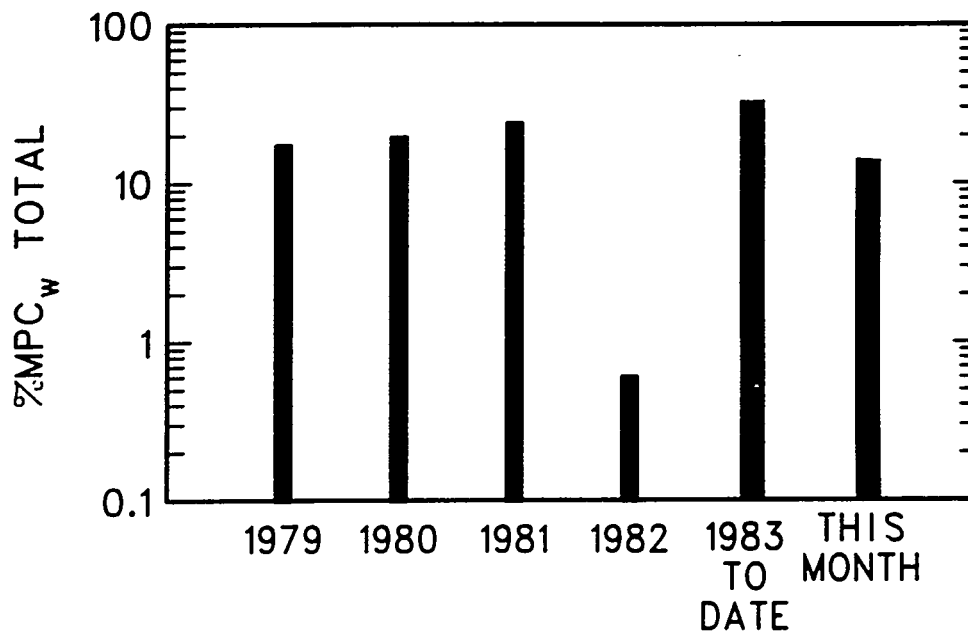


Fig.1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

*Tests show that complete mixing does not occur in the near reaches of the river.

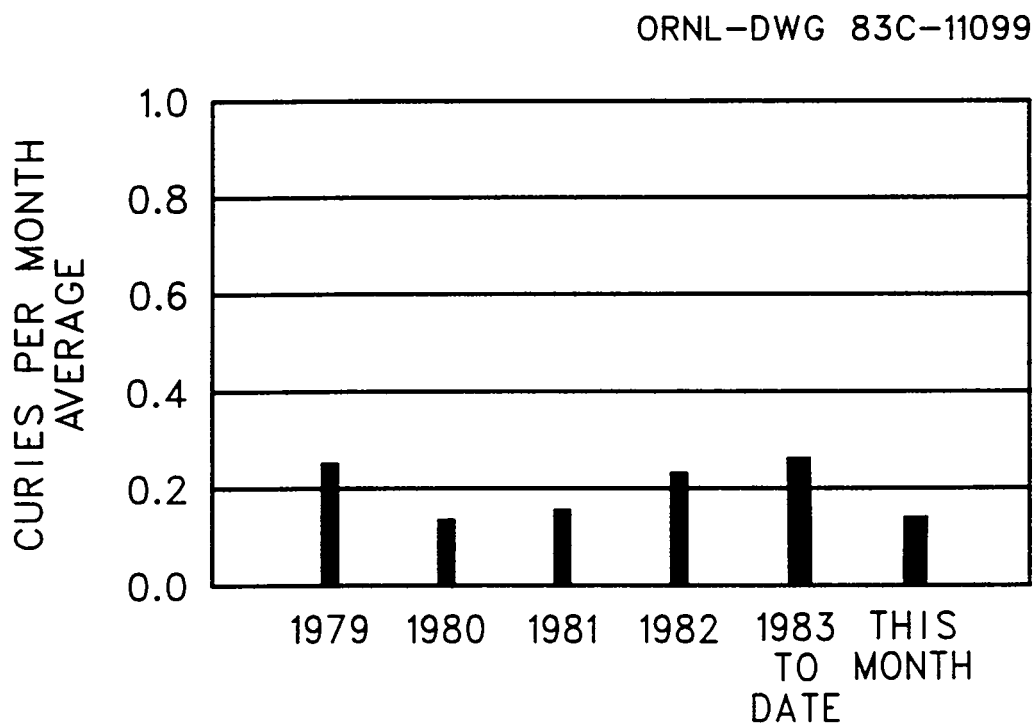


Fig.2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3)

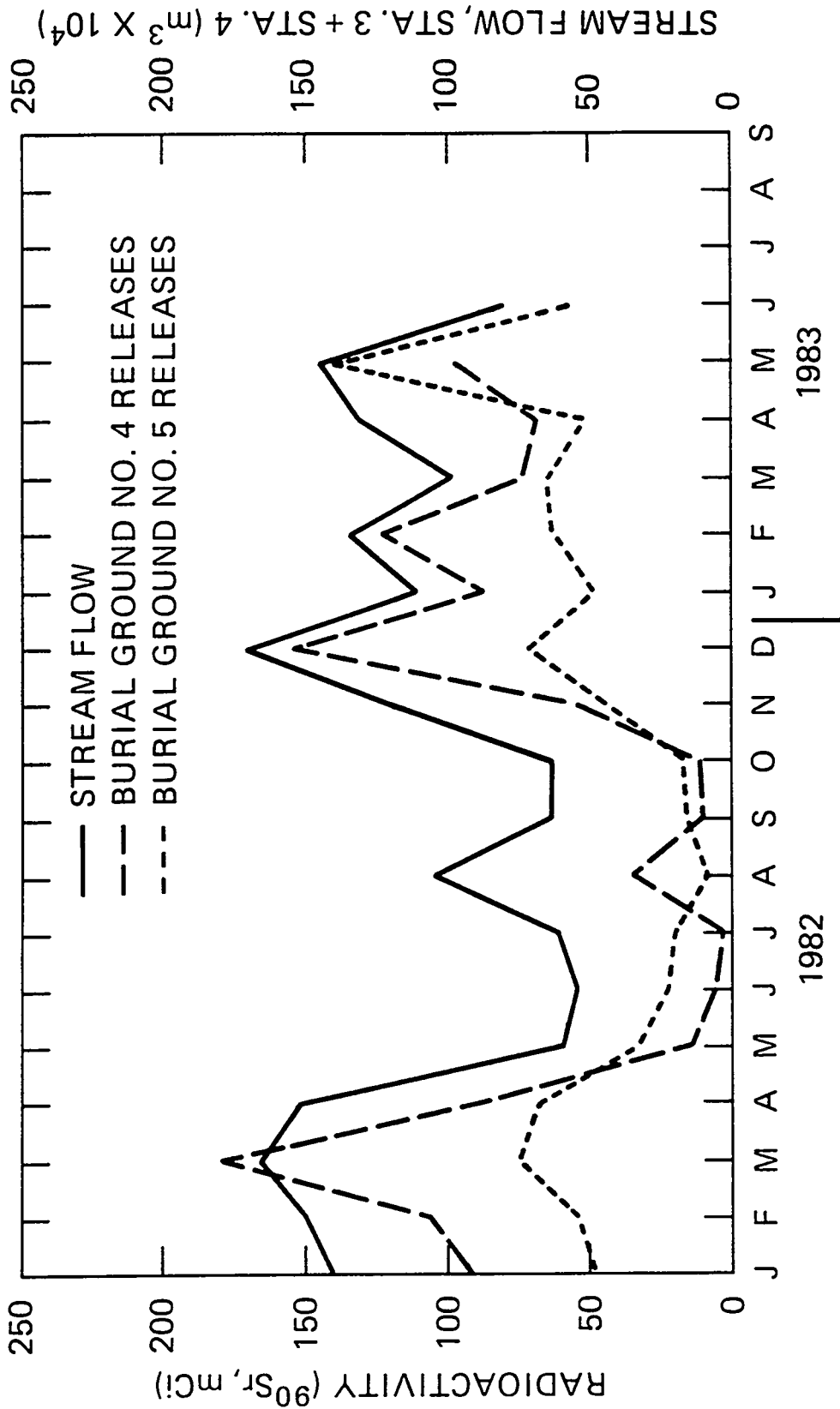


Fig. 2A. STREAM FLOW AND RADIOACTIVITY RELEASED TO WHITE OAK CREEK BY BURIAL GROUNDS 4 AND 5

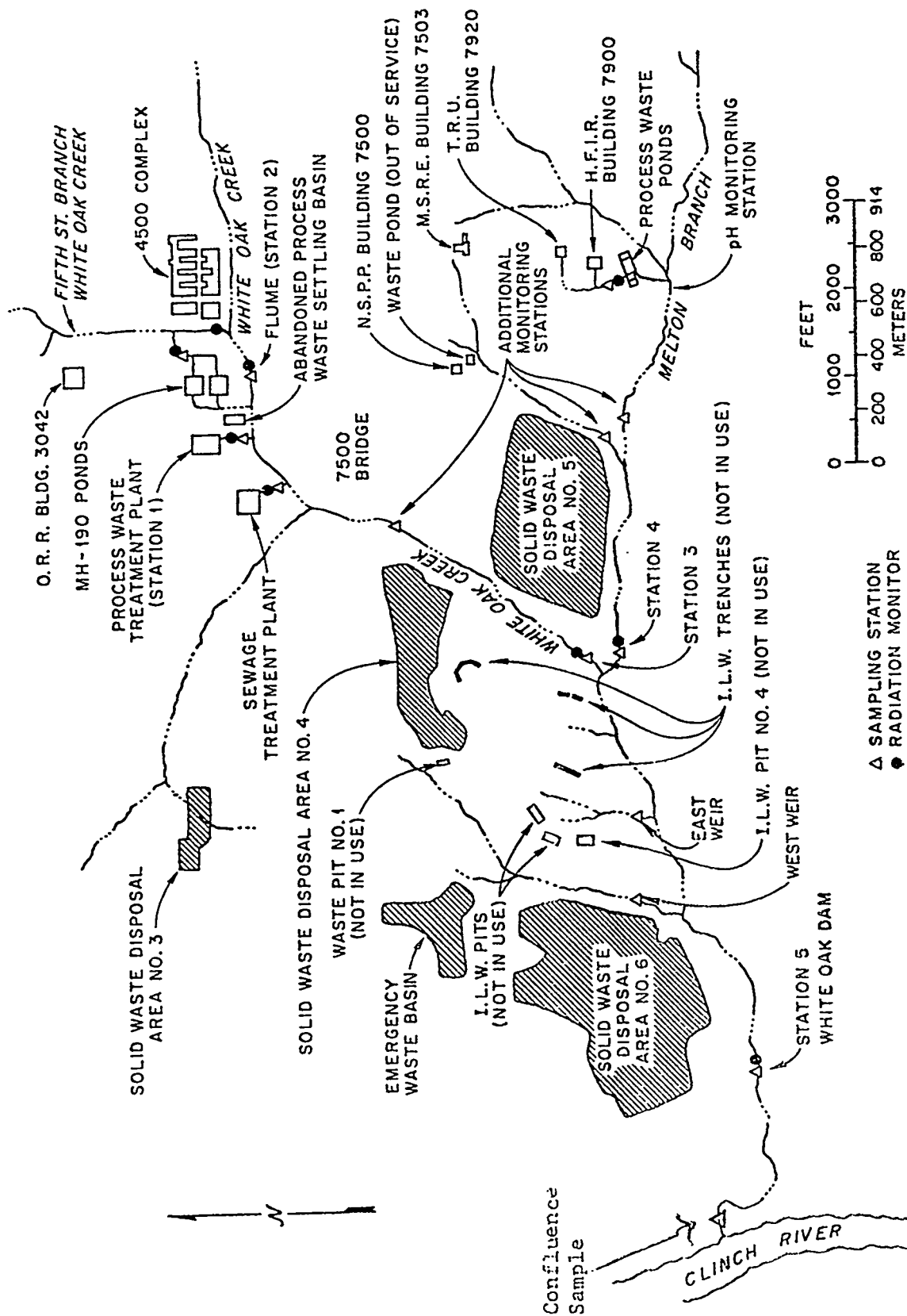


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

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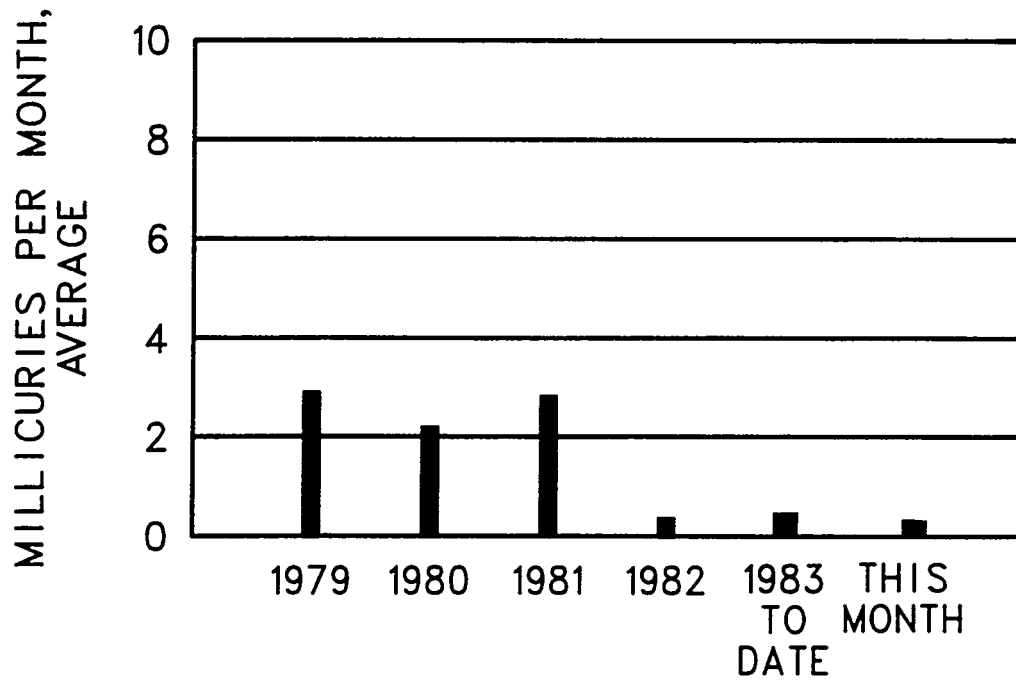


Fig.4 ^{90}Sr In-Process Waste Discharge to White Oak Creek

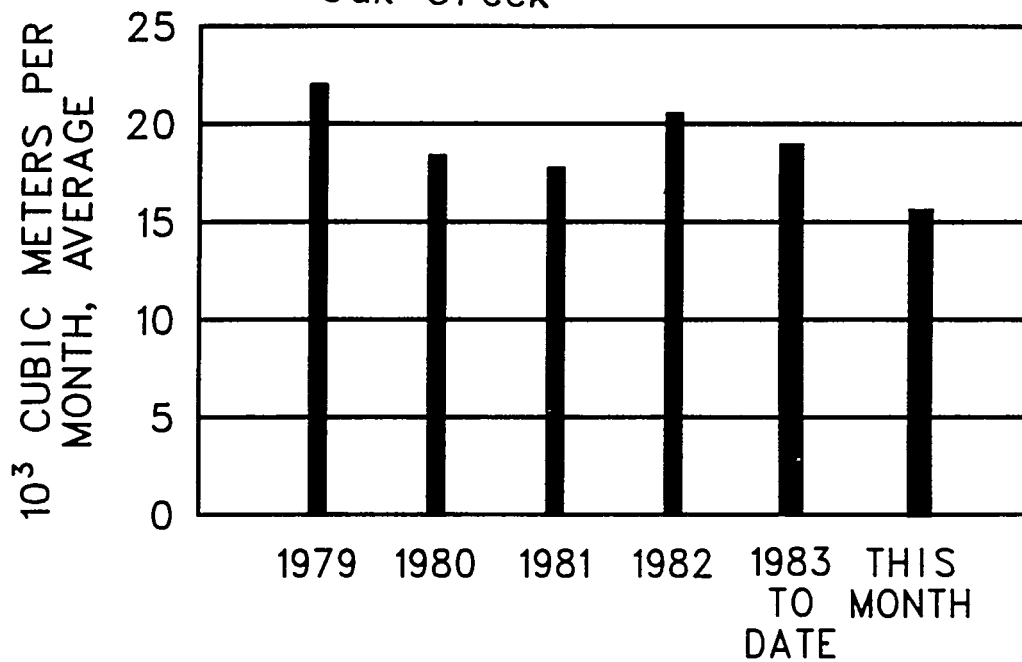


Fig.5. Process Waste Volumes.

ORNL-DWG 83C-11101

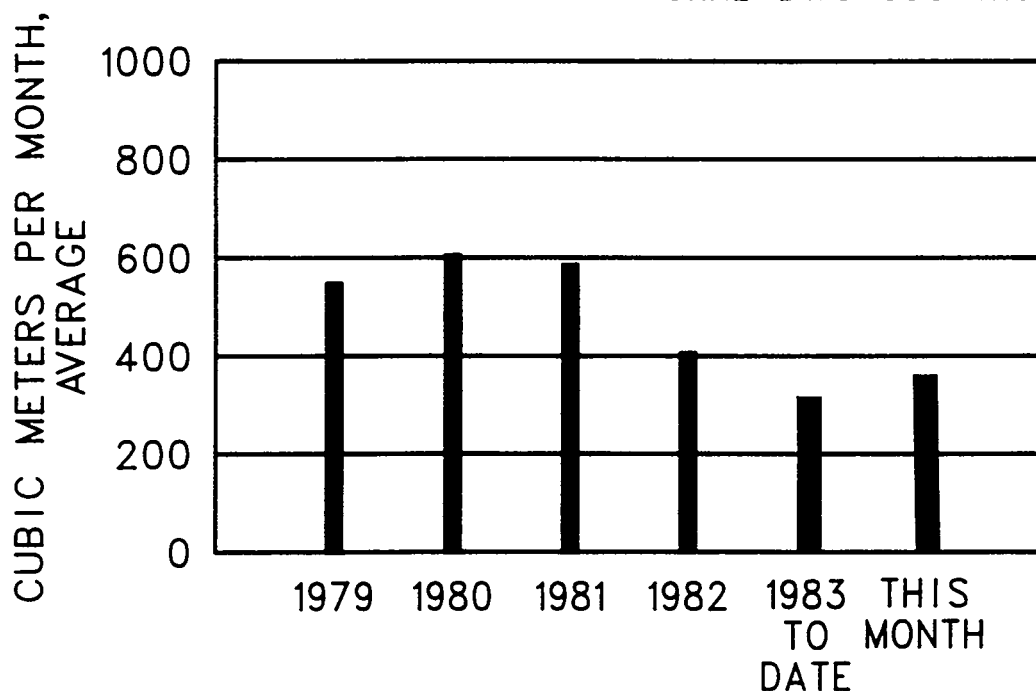


Fig.6. Intermediate-Level Waste Volumes.

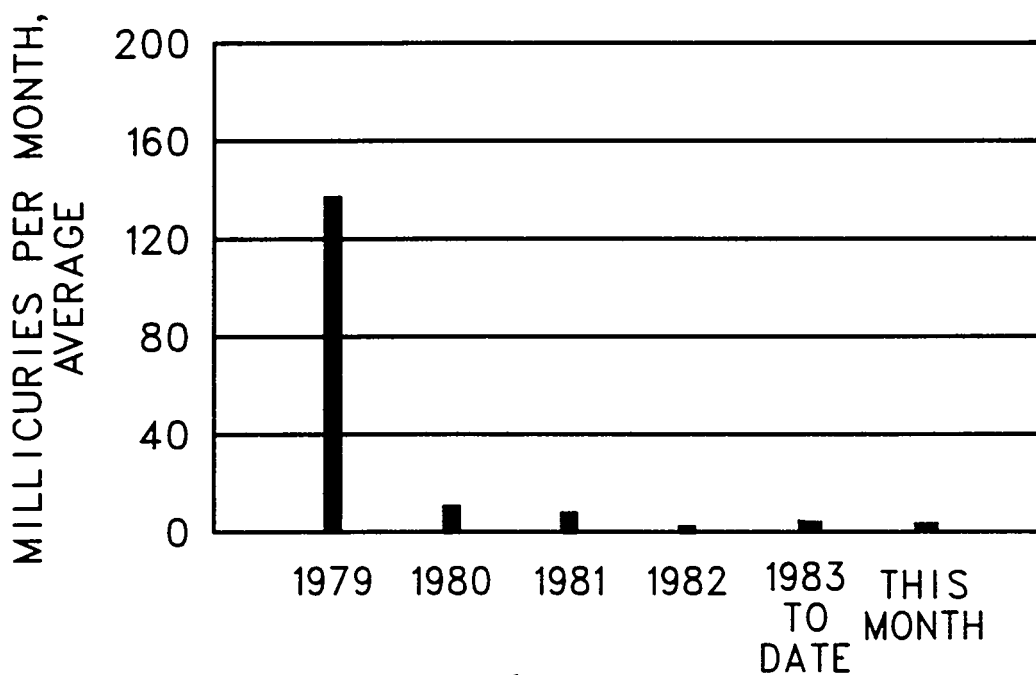


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0868	0.2411
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0594	0.1344
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0001	-----
Total discharge from all sources		0.1464	0.3755
White Oak Dam to Clinch River (ISAHP Measurements)		0.123	0.426

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/l	Cl	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	1800	0.200	26.8	4.11	19.2
Radioisotopes Processing Area (MH114 minus MH112)	---	0.249 ^a	33.4	1.50	7.0
Reactor Operations (MH112)	9	0.001	0.1	4.36	20.3
Buildings 3503 and 3508 (MH 229)	0.83	<0.001	---	0.82	3.8
Buildings 3025 and 3026 (MH 149)	12	<0.001	---	1.42	6.6
Building 3019 (MH 25)	4.8	<0.001	---	2.55	11.9
Waste Evaporator, Bldg. 2531 (MH 243)	550	0.030	4.0	2.02	9.4
Building 3525 (MH 235)	0.82	<0.001	---	0.47	2.2
Building 2026 (MH 240)	31	<0.001	0.1	1.39	6.5
Tank Farm Drainage	3500	0.265	35.6	2.80	13.1

^a The activity entered the process-waste system with inleakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (Ci)
HRLAL 2026	< 0.01	1
Central Radioactive Gas Disposal Facilities 3039	< 0.01	53
Radiochemical-Processing Pilot Plant 3020	< 0.01	30
MSRE 7512	< 0.01	1
HFIR and TRU 7911	< 0.01	24
Total Activity in Gases Released at X-10 Site	< 0.01	109
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	2280 (³ H)	
Building 4508 Ventilation Discharges Room 136 Room 265		4.48x10 ⁻² 1.66x10 ⁻²
Building 5505 Discharges Glove Box Hood		6.53x10 ⁻² 1.12

^a Activity primarily ¹³¹I except as noted. Does not include noble gases.

^b These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^c No data available at this time.

SUMMARY

Gunite sludge injection SI-6 was completed on July 14, 1983, and the sluicing of sludge from gunite tank W-6 continued throughout the reporting period.

Operation of the Waste Monitoring and Collection Systems for the month of July was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 93 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 78% of this total. The Industrial Safety and Applied Health Physics Division measured an 80 mCi release of ^{90}Sr at the White Oak Dam sample station ($0.1\% \text{ MPC}_W$ in the Clinch River for recorded flows). The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of July was 0.1% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 15.4% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases:

During the month, 0.080 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 56×10^4 and 12×10^4 m³, respectively. Fig. 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 92 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.5 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.2 mCi of ⁹⁰Sr was released from the 190 pond system; and a total of 10.9 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	4.1	
190 Ponds	0.2	
Process Waste Treatment Plant	0.5	
Sewage Treatment Plant	<u>10.9</u>	
	15.7	
7500 Sampling Station	52.0	
Burial Grounds 1 and 3, and Floodplains		36.6
Station 3	62.0	
Burial Ground 4		10.0

Melton Branch

7900 Area (HFIR and TRU)	2.1	
7500 Area (NSPP and MSRE)	<u>3.0</u>	
	5.1	
Station 4	30.6	
Burial Ground 5		25.5

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>0.1</u>	
	0.2	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	92.8	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		72.0
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		77.6%

Process Waste

A total of $1.40 \times 10^4 \text{ m}^3$ of process waste were treated by ion exchange. Of this amount $1.28 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek compared to previous months is shown in Fig. 4; the waste volume processed compared to previous months is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 24 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	34.5	22.5	29.9
Volume treated (m^3)	627	384	525

Intermediate Level Waste

The scheduled gunite sludge injection SI-6 was completed on July 11, 1983. A total of 208,000 gal of suspended sludge was slurried with 1,150,000 lb of blended cement and fly ash and pumped into the formation at a depth of 1,010 ft. Sludge injection SI-7 is scheduled for August 8, 1983.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.30 m³/h.

The summary of storage operations is given below.

	<u>m³</u>
Total volume generated	207.9
Volume transferred to evaporators	221.7
South Tank Farm Inventory:	
Beginning of Month	753.3
End of Month	845.6
Service Tank Inventory:	
W-21, Beginning of Month	25.8
W-21, End of Month	18.6
W-22, Beginning of Month	24.3
W-22, End of Month	17.7
W-23, Beginning of Month	72.4
W-23, End of Month	96.3
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	1,042.0
Total Volume at End of Month	1,116.8

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	12.0
Building 3019	6.1
Building 3525	16.8
Radioisotopes Processing Area	20.9
ORR and BSR	25.1
High Flux Isotope Reactor	26.2
Fission Products Development Laboratory	12.4*
4500 Complex	1.8
Building 3544	24.7

Gaseous Waste

The ORNL Stacks discharged <2 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was 107 µCi. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.3% and 4.2% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

*The storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

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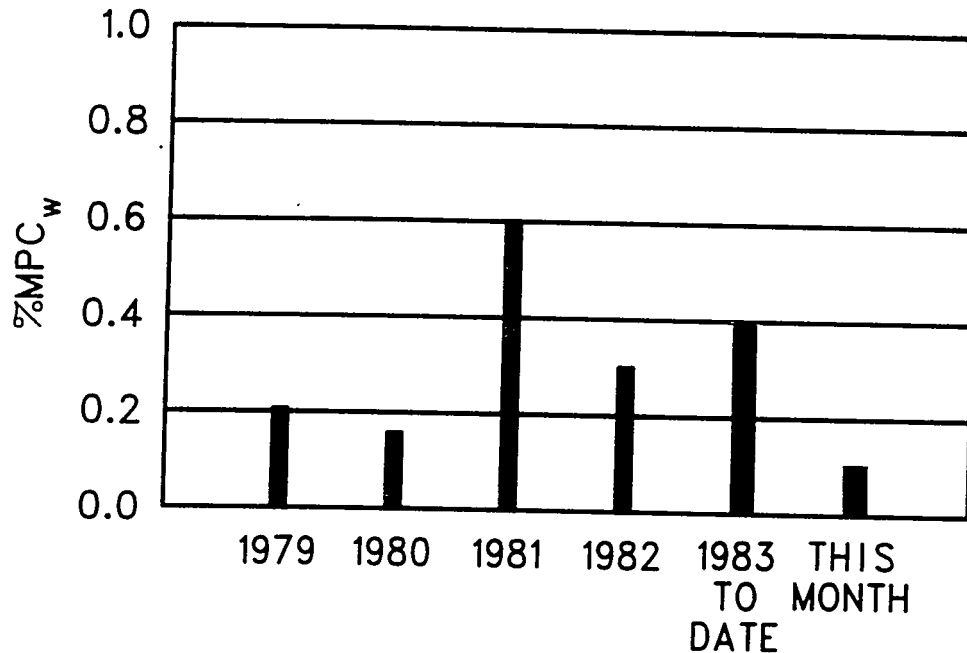


Fig.1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges*(ISAHP Measurements at White Oak Dam).

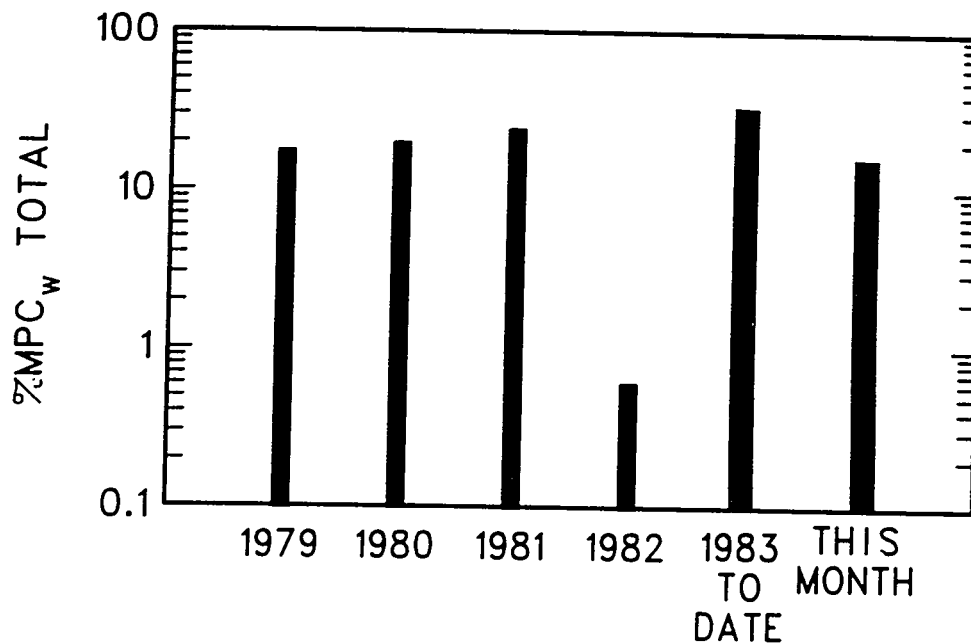


Fig.1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

*Tests show that complete mixing does not occur in the near reaches of the river.

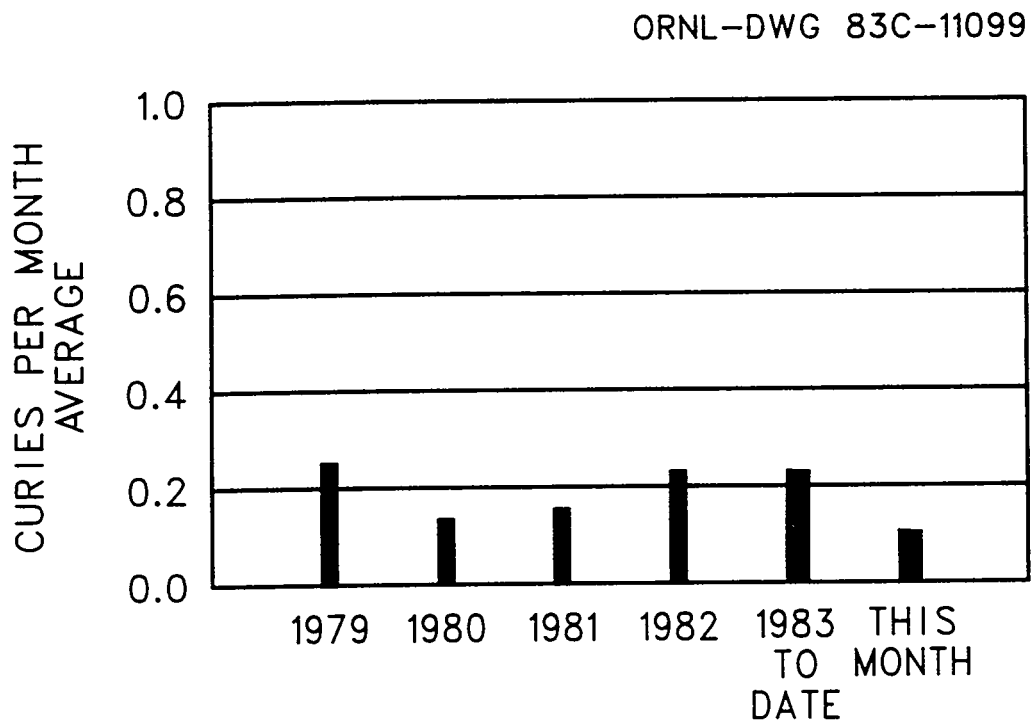


Fig.2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7)

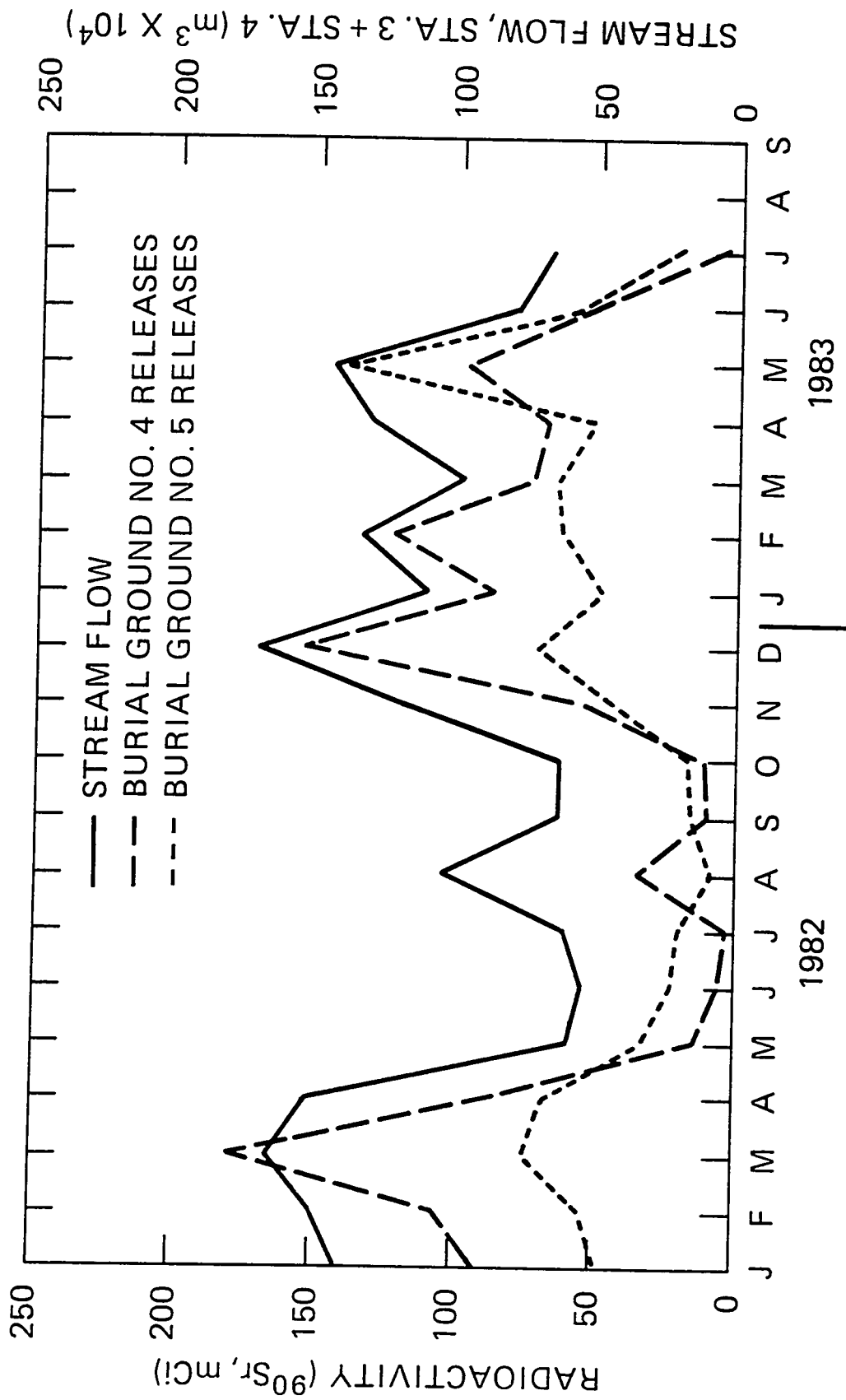


FIG. 2A **STREAM FLOW AND RADIOACTIVITY RELEASED TO WHITE OAK CREEK BY BURIAL GROUNDS 4 AND 5**

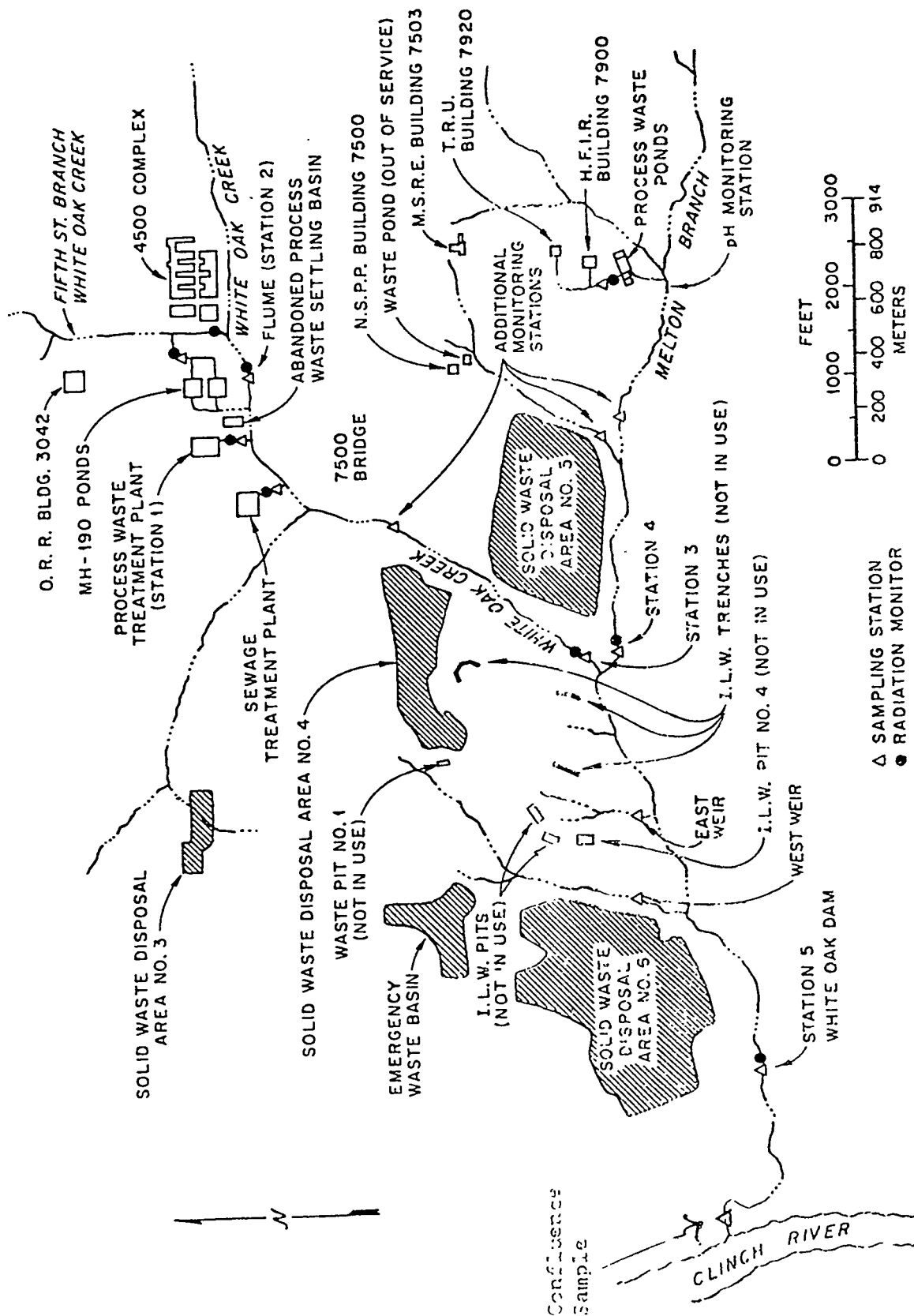


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

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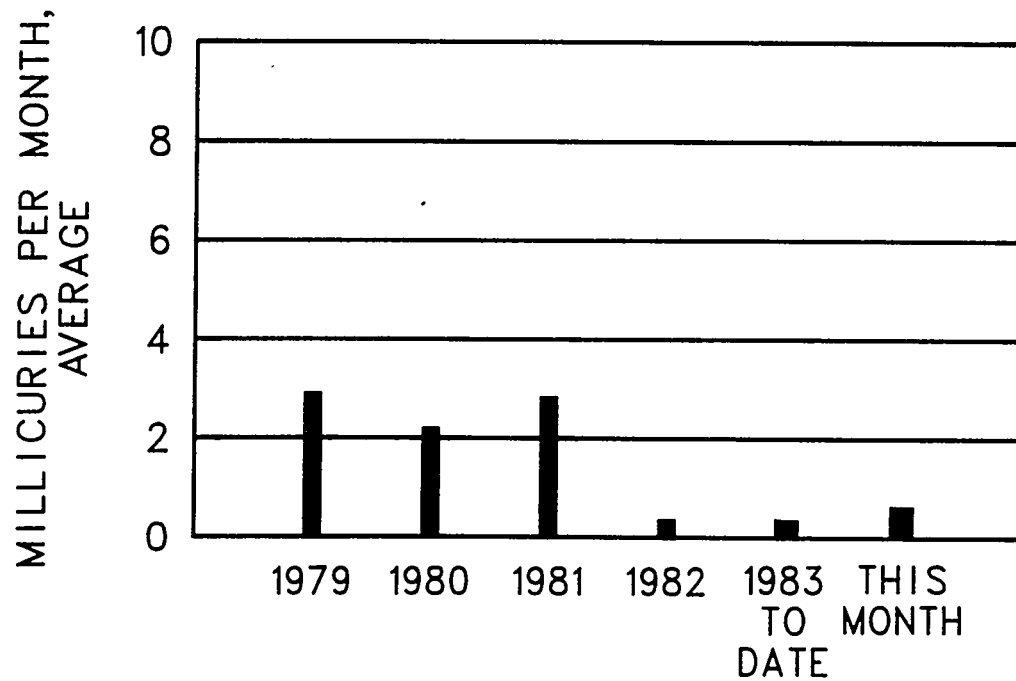
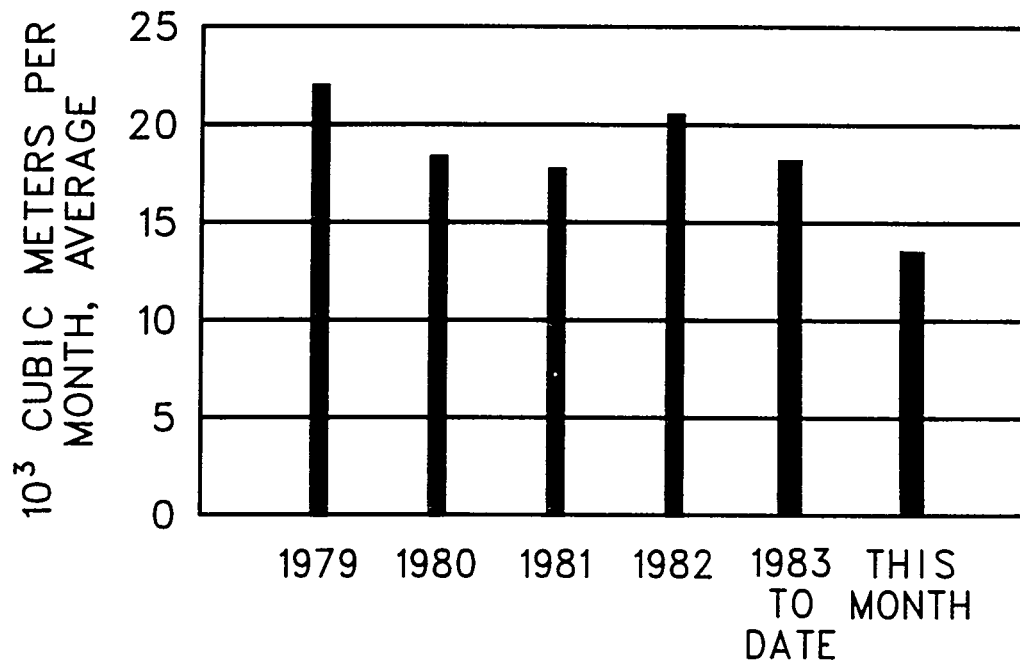
Fig.4. ^{90}Sr Discharge in Waste to White Oak Creek

Fig.5. Process Waste Volumes.

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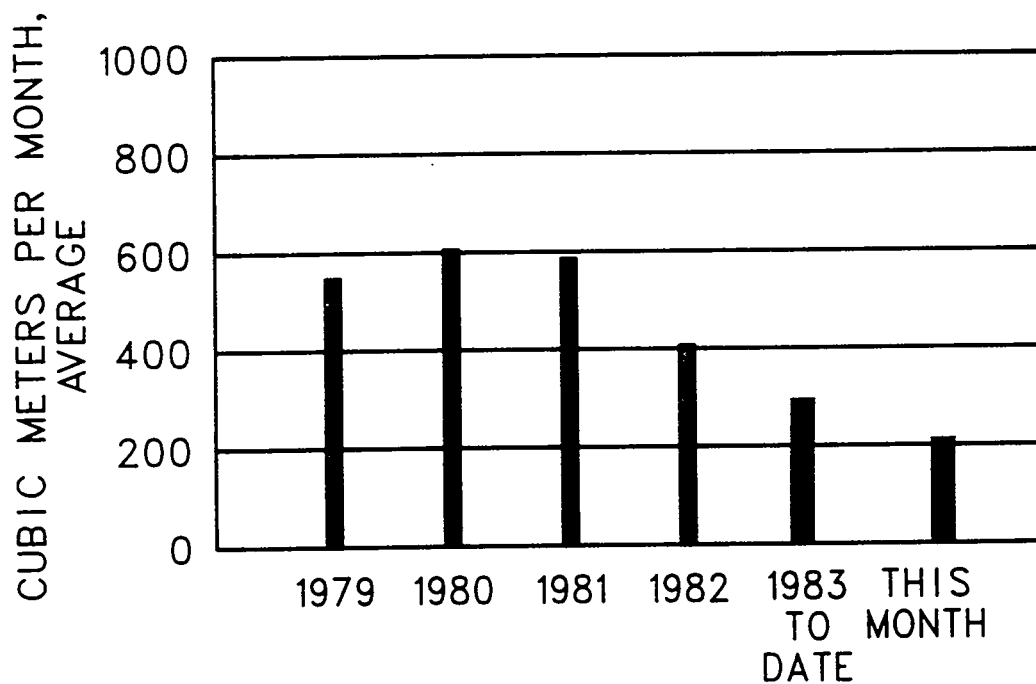


Fig.6. Intermediate-Level Waste Volumes.

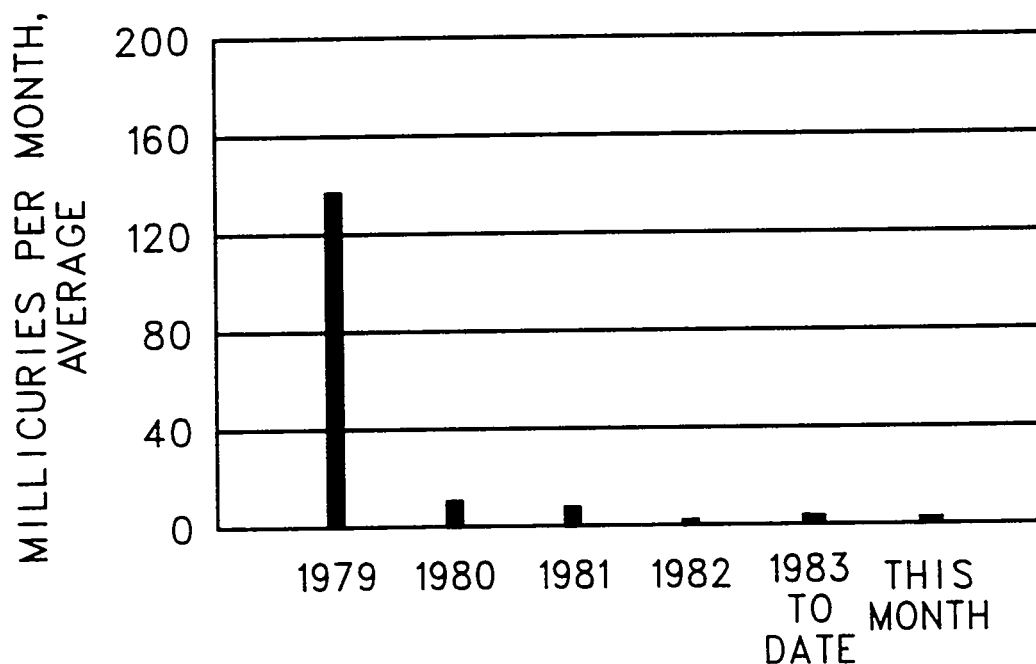


Fig.7 Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0620	0.1482
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0306	0.0740
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0001	-----
Total discharge from all sources		0.0928	0.2222
White Oak Dam to Clinch River (ISAHP Measurements)		0.080	0.326

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/l	CI	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	1900	0.183	28.4	3.56	17.6
Radioisotopes Processing Area (MH114 minus MH112)	---	0.193 ^a	29.9	1.19	5.9
Reactor Operations (MH112)	18	0.002	0.3	3.62	17.9
Buildings 3503 and 3508 (MH 229)	1.0	<0.001	---	1.20	5.9
Buildings 3025 and 3026 (MH 149)	16	<0.001	---	2.20	10.9
Building 3019 (MH 25)	4.0	<0.001	---	2.08	10.3
Waste Evaporator, Bldg. 2531 (MH 243)	1000	0.043	6.7	1.60	7.9
Building 3525 (MH 235)	9.4	<0.001	---	0.60	3.0
Building 2026 (MH 240)	2.8	<0.001	---	1.43	7.1
Tank Farm Drainage	3000	0.224	34.7	2.77	13.5

^a The activity entered the process-waste system with inleakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	< 0.01	1
Central Radioactive Gas Disposal Facilities	3039	< 0.01	64
Radiochemical-Processing Pilot Plant	3020	< 0.01	15
MSRE	7512	< 0.01	1
HFIR and TRU	7911	< 0.01	26
Activity in Gases Released at X-10 Site		< 0.01	107
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		3700 (^3H)	
Building 4508 Ventilation Discharges Room 136 Room 265			3.44×10^{-3} 7.80×10^{-5}
Building 5505 Discharges Glove Box Hood			5.02×10^{-3} 7.75×10^{-3}

^aActivity primarily ^{131}I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

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ORNL CF-83/ 335

DATE: November 2, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF August 1983

TO: Distribution

FROM: L. C. Lasher ²⁷ and C. B. Scott ²⁷

Sponsor: J. H. Swanks ²⁷

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SUMMARY

Gunite sludge injection SI-6 was completed August 10, 1983. The removal of sludge from tank W-6 was completed on August 5. The sluicing equipment was relocated from W-6 to W-7 and operations were resumed on August 29.

One unusual occurrence was reported during the period. (Report No. ORNL-83-13-OP-83-2). The MPC_w for ^{131}I was exceeded at White Oak Dam when measurement at this point reached 400 pCi/L (133% of the limit).

A total of 108 mCi of ^{90}Sr was discharged into White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 76% of this total. The Environmental and Occupational Safety Division measured a 116 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 6 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of August was 0.1% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 6.9% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.116 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Stations 3 and 4 were 50×10^4 and 8×10^4 m³, respectively. Fig. 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 107 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant; 0.3 mCi of ⁹⁰Sr was released from the 190 pond system; and a total of 17.5 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	3.8	
190 Ponds	0.3	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>17.5</u>	
	21.8	
7500 Sampling Station	97.7 (1)	
Burial Grounds 1 and 3, and Floodplains		75.9
Station 3	92.6 (1)	
Burial Ground 4		0

Melton Branch

7900 Area (HFIR and TRU)	0.2	
7500 Area (NSPP and MSRE)	<u>3.4</u>	
	3.6	
Station 4	14.7	
Burial Ground 5		11.1

ILW Pit Disposal Area

East Weir	0 (2)	
West Weir	0	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	107.3	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		87.0
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		81.1%

- (1) This discrepancy is attributed to one or a combination of the following sources of error: the inherent errors of pneumatic flow measuring system, sample collection and handling, cross contamination, analytical techniques.

- (2) No flow at these stations during the period

Process Waste

A total of $1.45 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount $1.35 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek compared to previous months is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 26 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	37.5	19.5	30
Volume treated (m^3)	680	440	558

Intermediate Level Waste

The scheduled sludge injection SI-7 was completed on August 8, 1983. A total of 619 m^3 (163,600 gal) of suspended sludge was slurried with 458,600 kg (1,009,000 lb) of blended cement and fly ash and pumped into the formation at a depth of 1,010 ft. Sludge injection SI-8 is scheduled for October 24, 1983.

The sluicing of gunite tank W-6 was finished on August 5. The sluicing equipment and pumps were then relocated in preparation for the sluicing of gunite tank W-7. This operation began on August 29. Approximately 43 m^3 of resuspended sludge were transferred to the Melton Valley Waste Storage Facility to be injected.

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boil down rate was $0.22 \text{ m}^3/\text{h}$.

The summary of storage operations is given below.

	<u>m^3</u>
Total volume generated	202.9
Volume transferred to evaporators	163.1
South Tank Farm Inventory:	
Beginning of Month	845.6
End of Month	852.5
Service Tank Inventory:	
W-21, Beginning of Month	18.6
W-21, End of Month	27.4
W-22, Beginning of Month	17.7
W-22, End of Month	48.7
W-23, Beginning of Month	96.3
W-23, End of Month	105.3
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	1,116.8
Total Volume at End of Month	666.1

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	$\frac{m^3}{m}$
Transuranium Processing Area	9.5
Building 3019	18.1
Building 3525	20.3
Radioisotopes Processing Area	16.9
ORR and BSR	32.6
High Flux Isotope Reactor	20.7
Fission Products Development Laboratory	11.9*
4500 Complex	20.9
Building 3544	33.4

Gaseous Waste

The ORNL stacks discharged <6 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was 566 μCi . Inert gases released from the 3039 and 7911 Stacks averaged less than 1.1% and 4.3%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

*The storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

UNUSUAL OCCURRENCE

Unusual Occurrence Report ORNL-83-OP-83-2, Contamination of the Sanitary System by Process Waste.

The MPC_w for ^{131}I was exceeded on August 27 when the concentration of this nuclide reached 400 pCi/L at White Oak Dam. The contaminant was released into the watershed via the Process and Sanitary Waste Systems. Its source was identified as the overhead from the ILW evaporator which normally discharges into the Process Waste System. A leak from the drain line which connects the evaporator to the Process Waste System contaminated the Sanitary System. The overhead became contaminated when ILW containing ^{131}I was fed to the evaporator vessel which had been allowed to go acid.

ORNL-DWG 83C-11098

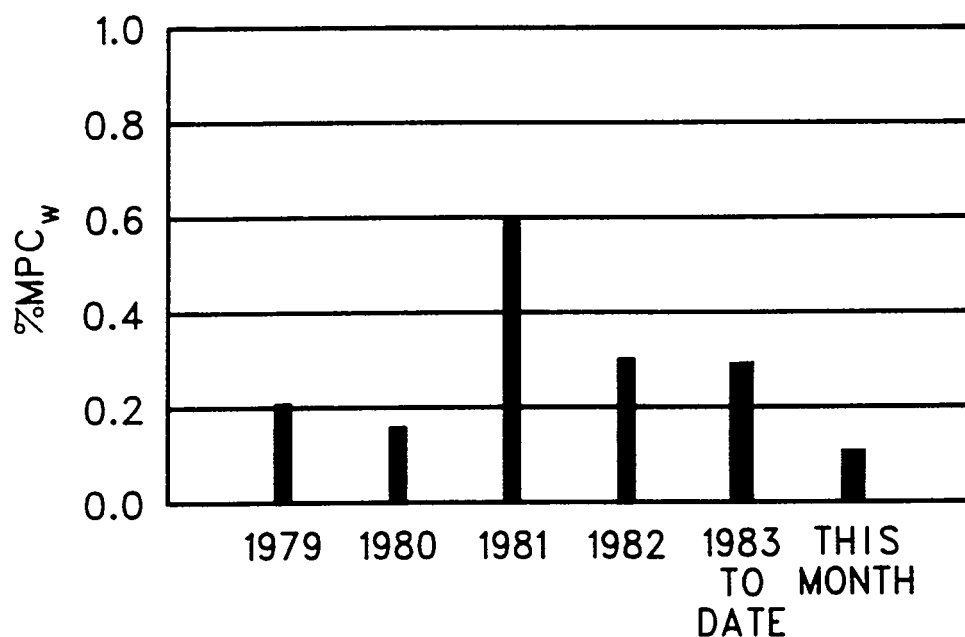


Fig.1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges*(ISAHP Measurements at White Oak Dam).

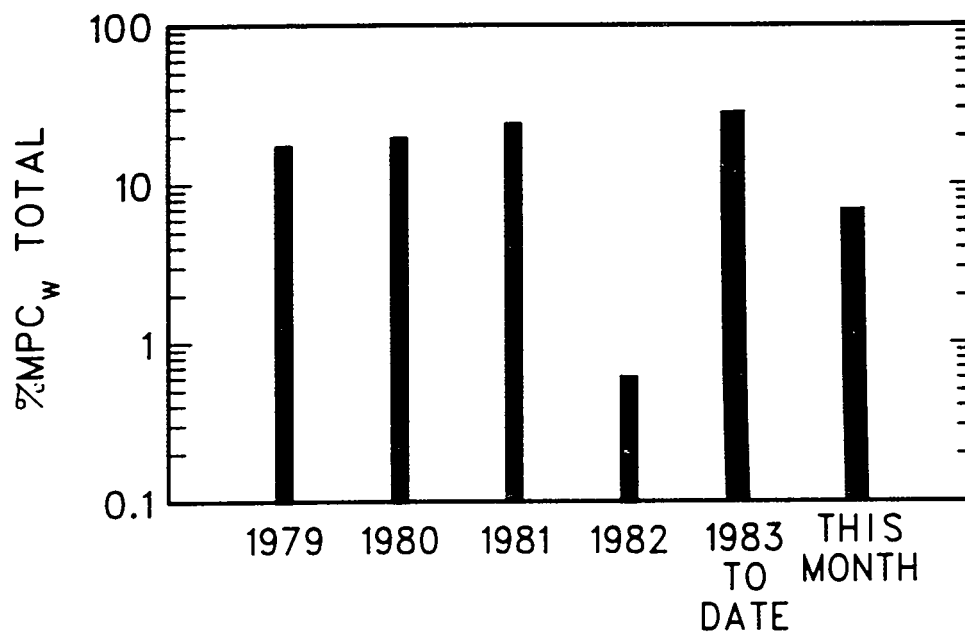


Fig.1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

*Tests show that complete mixing does not occur in the near reaches of the river.

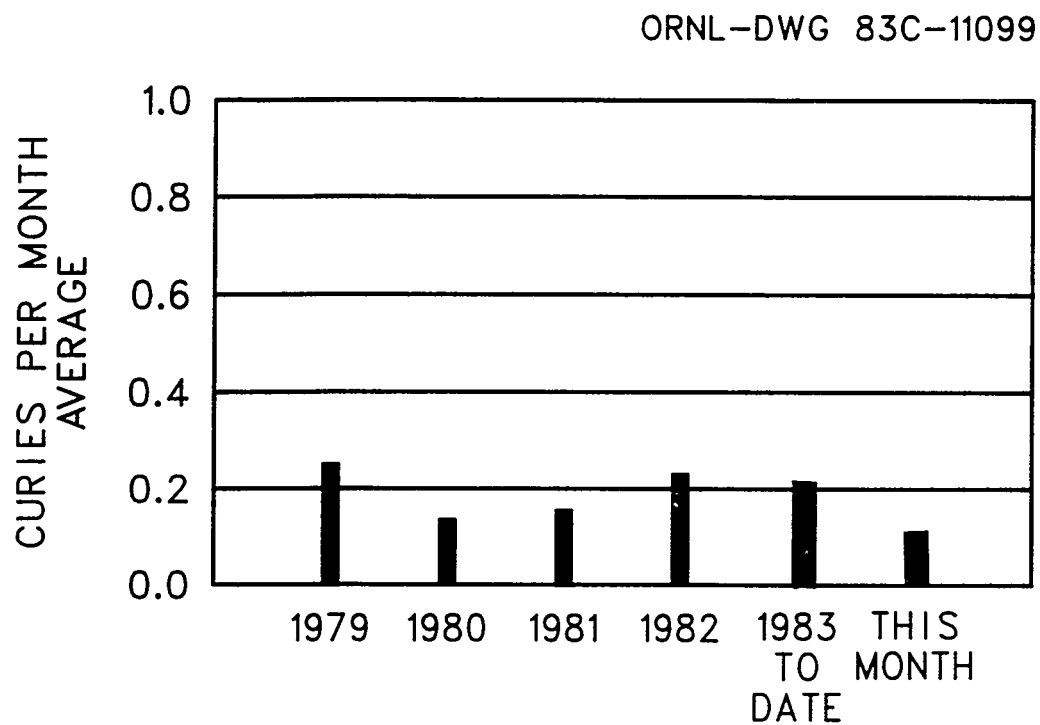


Fig.2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.7)

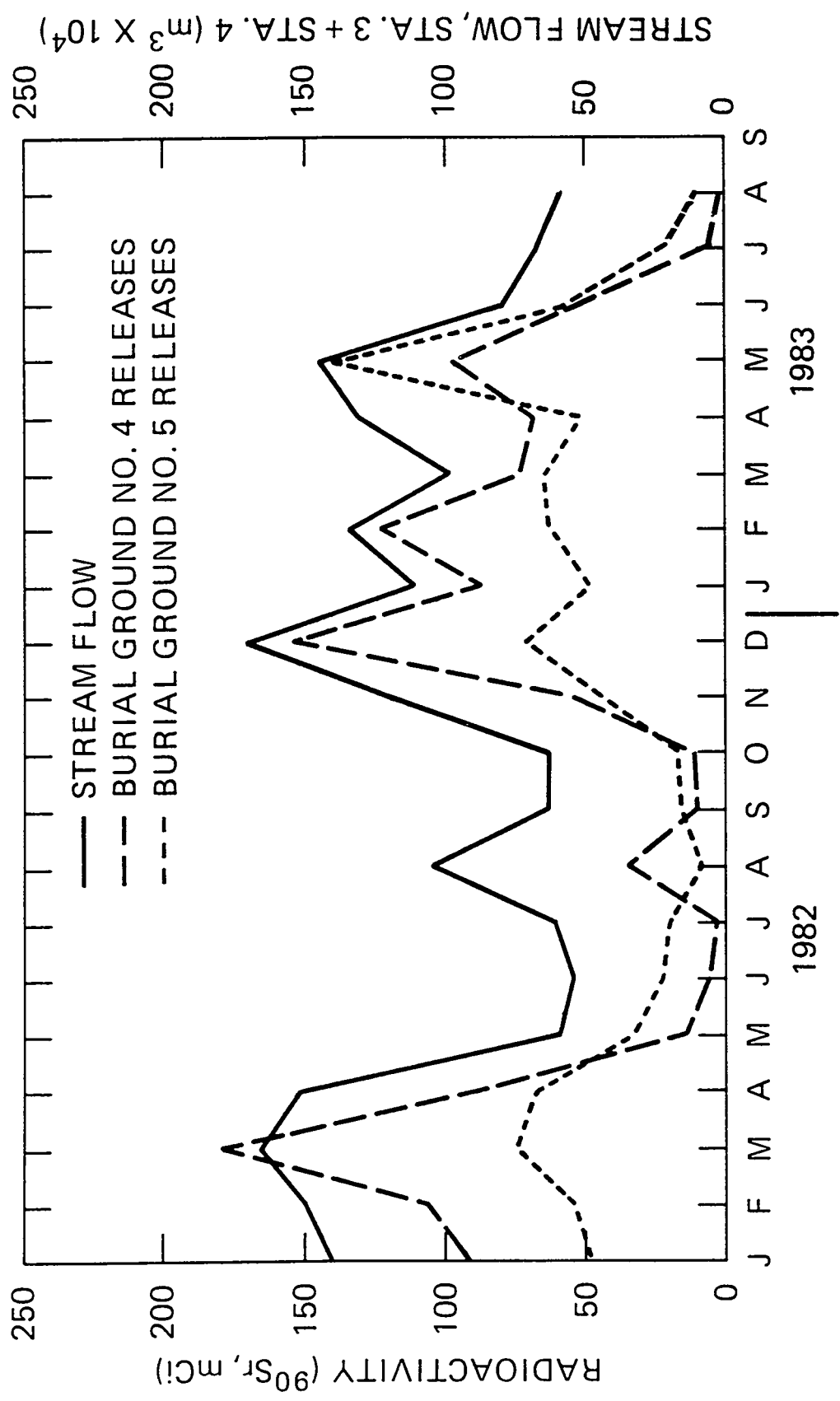


Fig.2A. STREAM FLOW AND RADIOACTIVITY RELEASED TO WHITE
OAK CREEK BY BURIAL GROUNDS 4 AND 5

ORNL-DWG 78-16246R

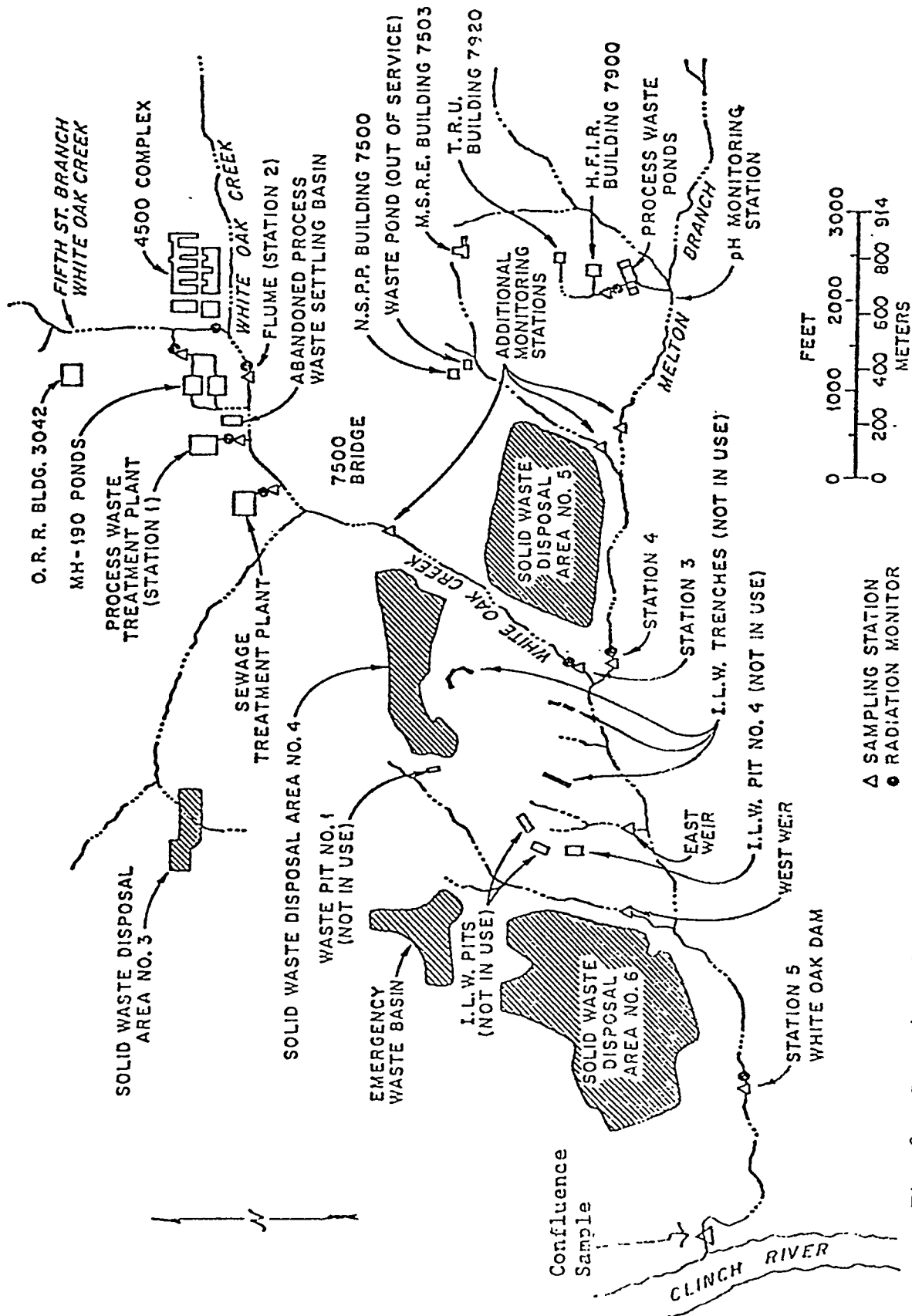


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

ORNL-DWG 83C-11100

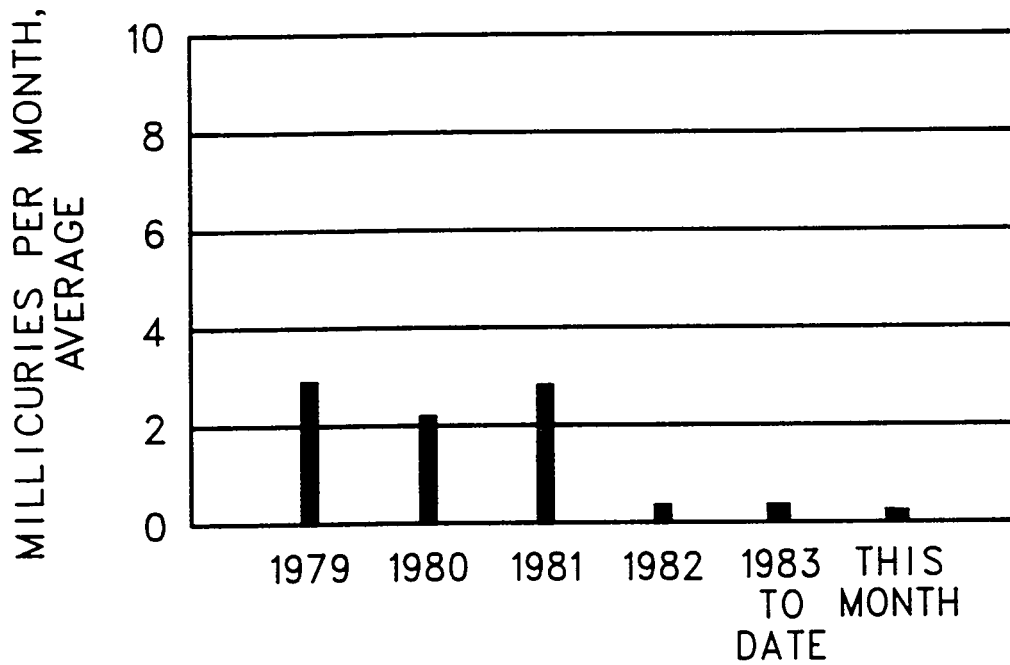
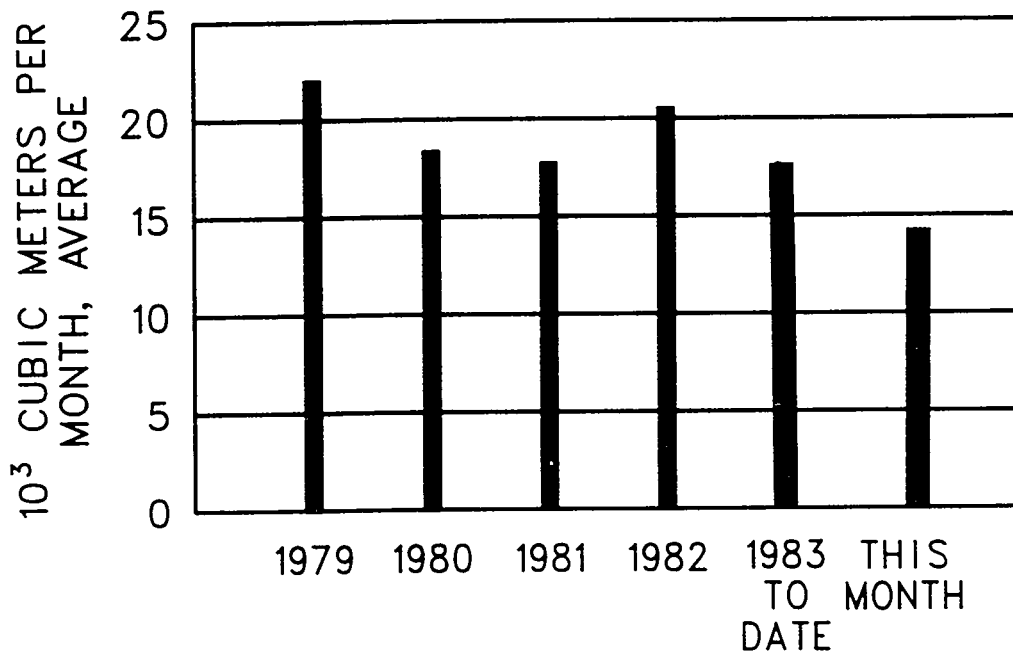
Fig.4. ^{90}Sr Discharge in Waste to White Oak Creek

Fig.5. Process Waste Volumes.

ORNL-DWG 83C-11101

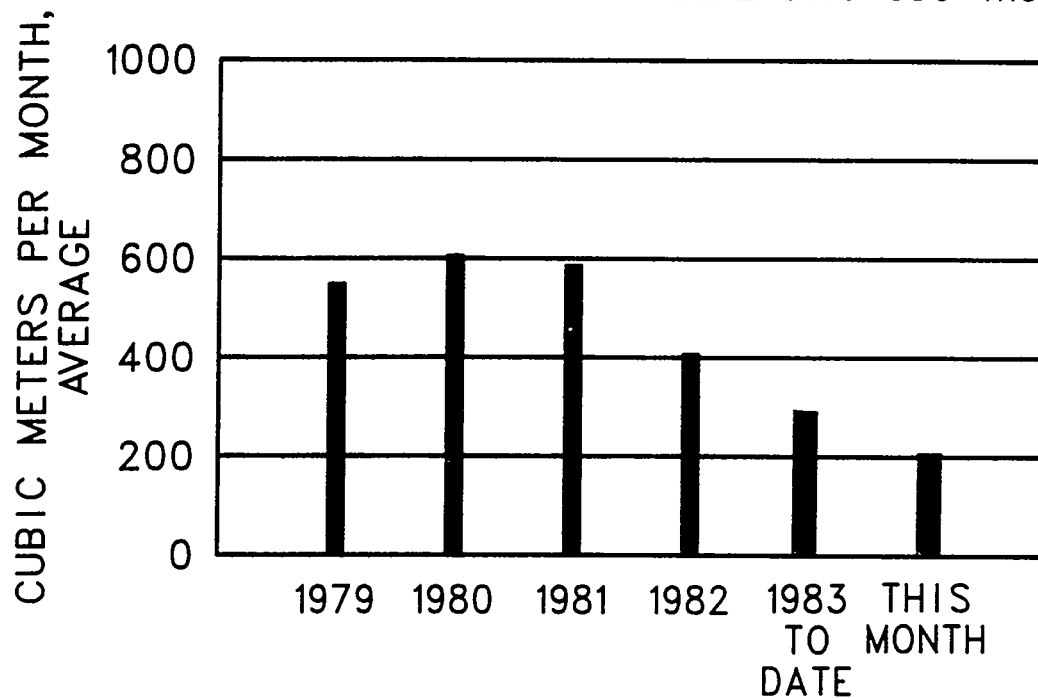


Fig.6. Intermediate-Level Waste Volumes.

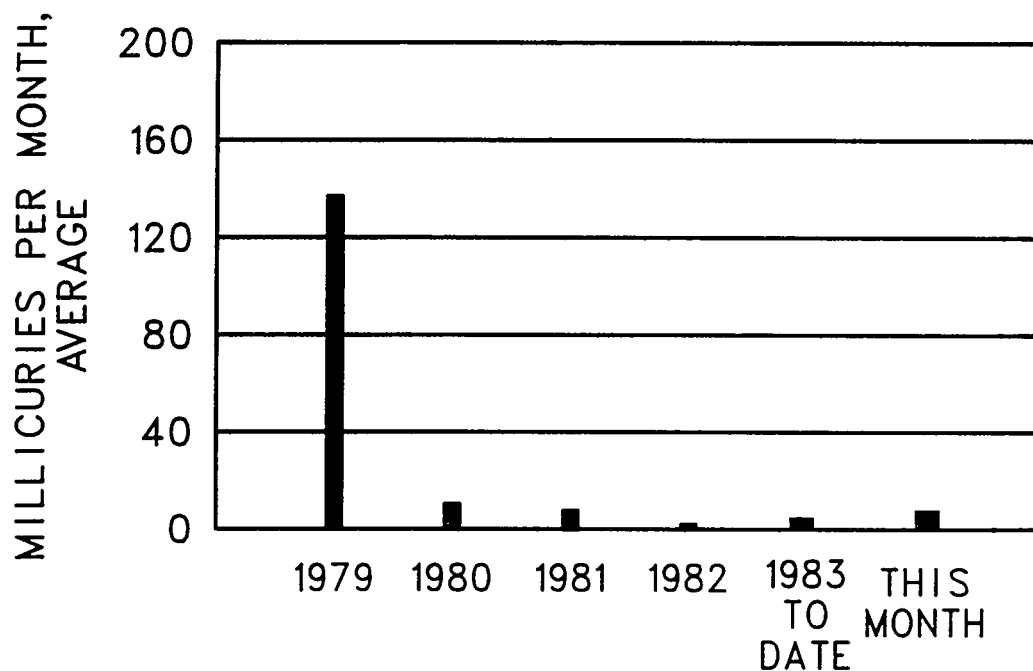


Fig.7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Non-Adsorbable species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0926	0.3087
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0147	0.0366
Discharge from ILW Pits and Trenches	East Weir	<0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	<0.0001	-----
Total discharge from all sources		0.1073	0.3453
White Oak Dam to Clinch River (ISAHP Measurements)		0.116	0.497

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Cl	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	840	0.089	15.4	3.91	18.5
Radioisotopes Processing Area (MH114 minus MH112)	---	0.188 ^a	32.5	1.41	6.7
Reactor Operations (MH112)	23	0.002	0.3	2.49	11.8
Buildings 3503 and 3508 (MH 229)	0.46	<0.001	---	2.21	10.5
Buildings 3025 and 3026 (MH 149)	8.5	<0.001	---	2.99	14.1
Building 3019 (MH 25)	5.6	<0.001	---	2.15	10.2
Waste Evaporator, Bldg. 2531 (MH 243)	1200	0.049	8.5	1.50	7.1
Building 3525 (MH 235)	4.0	<0.001	---	0.60	2.8
Building 2026 (MH 240)	3.2	<0.001	---	1.36	6.4
Tank Farm Drainage	3700	0.250	43.3	2.51	11.9

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	< 0.01	1
Central Radioactive Gas Disposal Facilities	3039	< 0.01	523
Radiochemical-Processing Pilot Plant	3020	< 0.01	5
MSRE	7512	< 0.01	1
HFIR and TRU	7911	< 0.01	36
Total Activity in Gases Released at X-10 Site		< 0.01	566
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		C (3 H)	---
Building 4508 Ventilation Discharges Room 136 Room 265			4.48×10^{-2} 1.66×10^{-2}
Building 5505 Discharges Glove Box Hood			6.53×10^{-2} 1.12

^a Activity primarily ^{131}I except as noted.

^b These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^c No data available at this time.

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CENTRAL FILES NUMBER

ORNL/CF-84/78

DATE: March 21, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF SEPTEMBER 1983

TO: Distribution

FROM: L. C. Lasher ¹

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hamlin 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

There was no waste injection scheduled during the month. The south work platform was moved from W-6 to W-8, and the three caissons on W-8 were core drilled. The sluicing of W-7 was completed September 21, and the sluicer and related equipment are currently being moved to W-8.

A total of 58 mCi of ^{90}Sr was discharged into White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 72% of this total. The Environmental and Occupational Safety Division measured a 76 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of September was 0.1% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 3.4% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.076 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 45×10^4 and $4 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 103 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 1.0 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.3 mCi of ^{90}Sr was released from the 190 pond system, and a total of 10.7 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	3.2	
190 Ponds	0.1	
Process Waste Treatment Plant	1.0	
Sewage Treatment Plant	<u>13.7</u>	
	18.0	
7500 Sampling Station	54.0 ^a	
Burial Grounds 1 and 3 and Floodplains		36.0
Station 3	50.1 ^a	
Burial Ground 4		0

Melton Branch

7900 Area (HFIR and TRU)	0.2	
7500 Area (NSPP and MSRE)	<u>2.2</u>	
	2.4	
Station 4	8.3	
Burial Ground 5		5.9

ILW Pit Disposal Area

East Weir	0 ^b	
West Weir	0	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	58.4	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		41.9
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		71.7%

^aThis discrepancy is attributed to one or a combination of the following sources of error: the inherent errors of pneumatic flow measuring system, sample collection and handling, cross contamination, and analytical techniques.

^bNo flow at these stations during the period.

Process Waste

A total of $1.51 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.24 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 27 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	37	17.5	26.5
Volume treated (m^3)	700	400	559

Low-Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.23 m³/h.

The summary of storage operations is given below.

	<u>m³</u>
Total volume generated	226.2
Volume transferred to evaporators	164.3
South Tank Farm Inventory:	
Beginning of Month	852.5
End of Month	639.5
Service Tank Inventory:	
W-21, Beginning of Month	27.4
W-21, End of Month	85.9
W-22, Beginning of Month	48.7
W-22, End of Month	52.1
W-23, Beginning of Month	105.3
W-23, End of Month	134.6
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	666.1
Total Volume at End of Month	599.0

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of LLW generated each month.

	$\frac{m^3}{m}$
Transuranium Processing Area	18.4
Building 3019	5.2
Building 3525	17.0
Radioisotopes Processing Area	15.2
ORR and BSR	29.1
High Flux Isotope Reactor	28.2
Fission Products Development Laboratory	12.4*
4500 Complex	3.9
Building 3544	44.6

*The storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <2 mCi of gaseous ^{131}I this month. The total amount of active particulates released during the period was $387 \mu\text{Ci}$. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.2% and 1.8%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

ORNL-DWG 83C-11098A

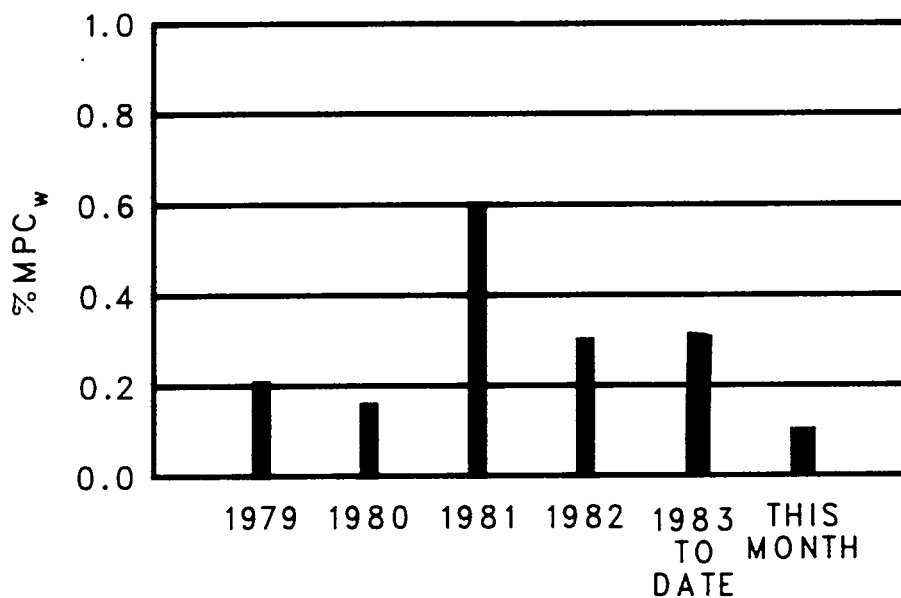


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Measurements at White Oak Dam and Assuming Complete Mixing of White Oak Creek with Clinch River).

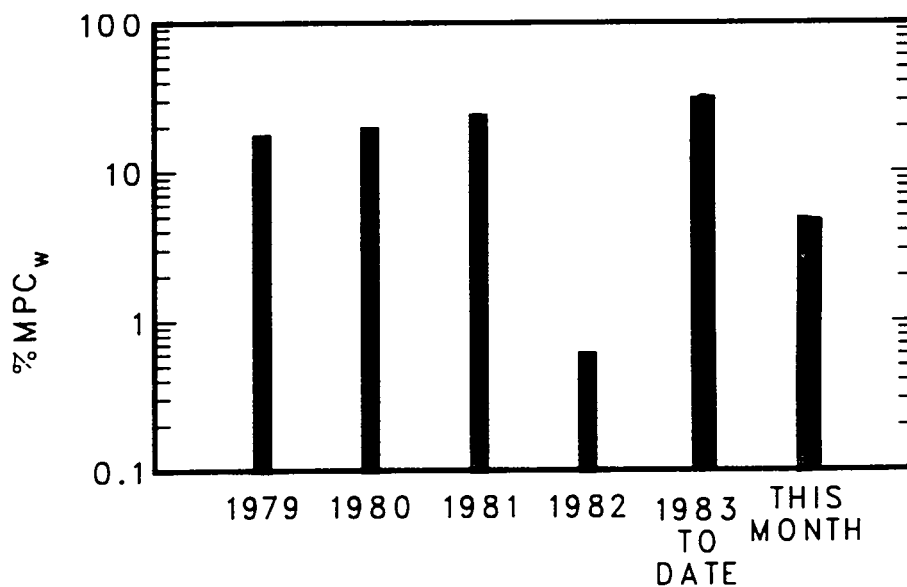


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Sampling at Confluence of White Oak Creek and the Clinch River before Appreciable Mixing has Occurred).

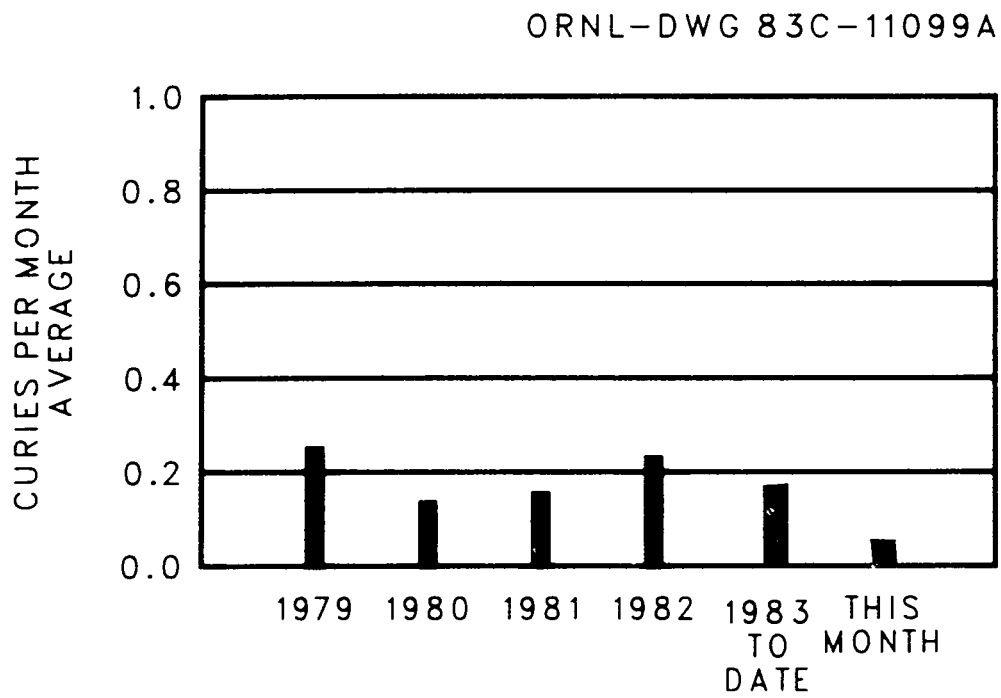


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3)

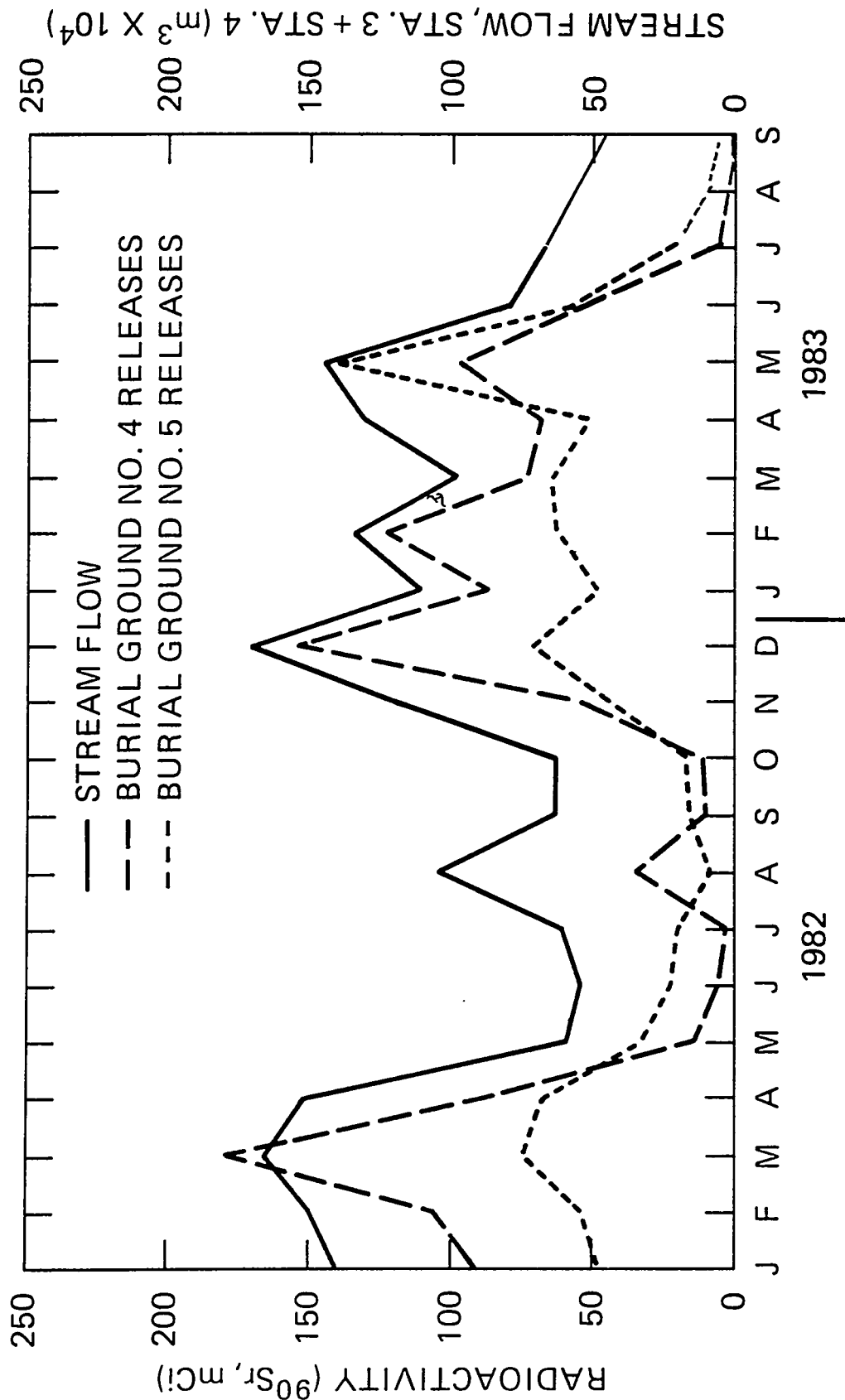


Fig.2A. STREAM FLOW AND RADIOACTIVITY RELEASED TO WHITE OAK CREEK BY BURIAL GROUNDS 4 AND 5

ORNLDWG 78-16246R2

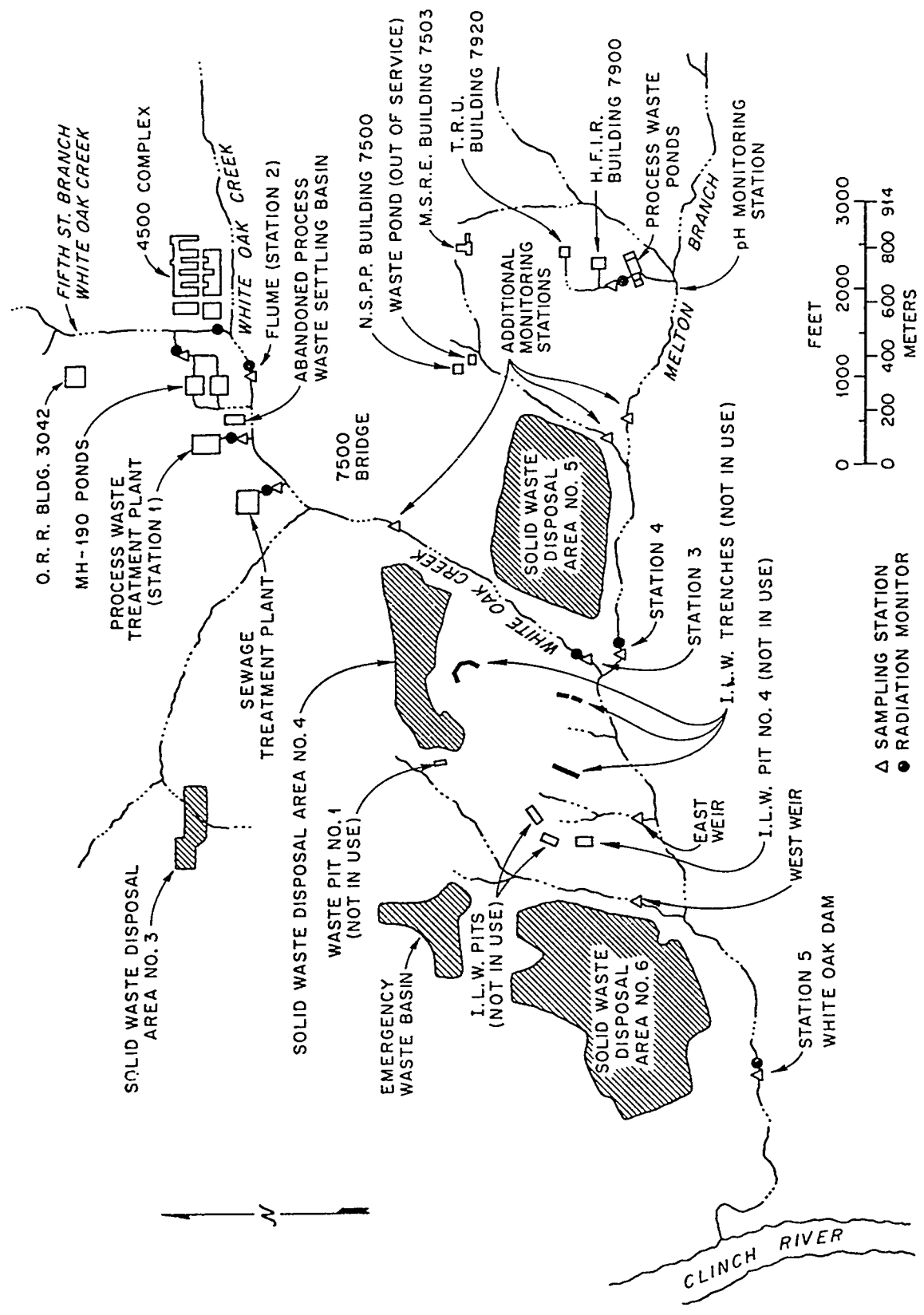


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100A

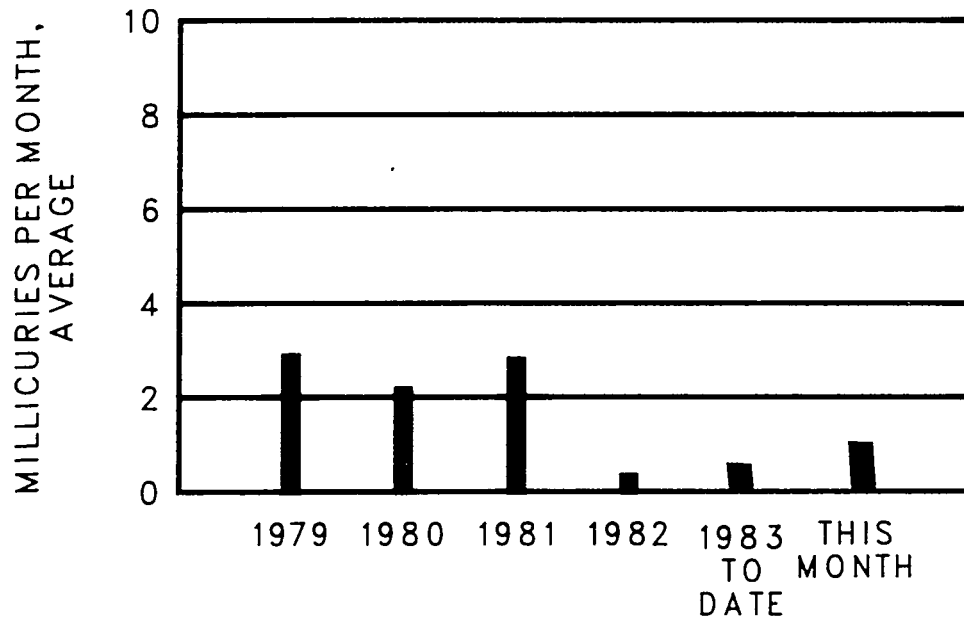


Fig. 4. ^{90}Sr Discharges in Waste to White Oak Creek.

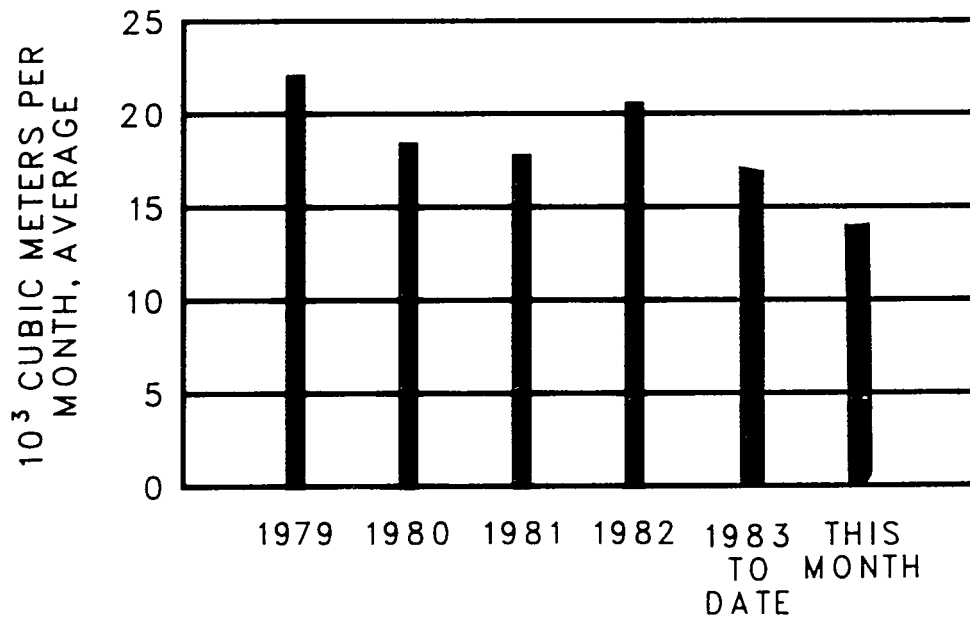


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101A

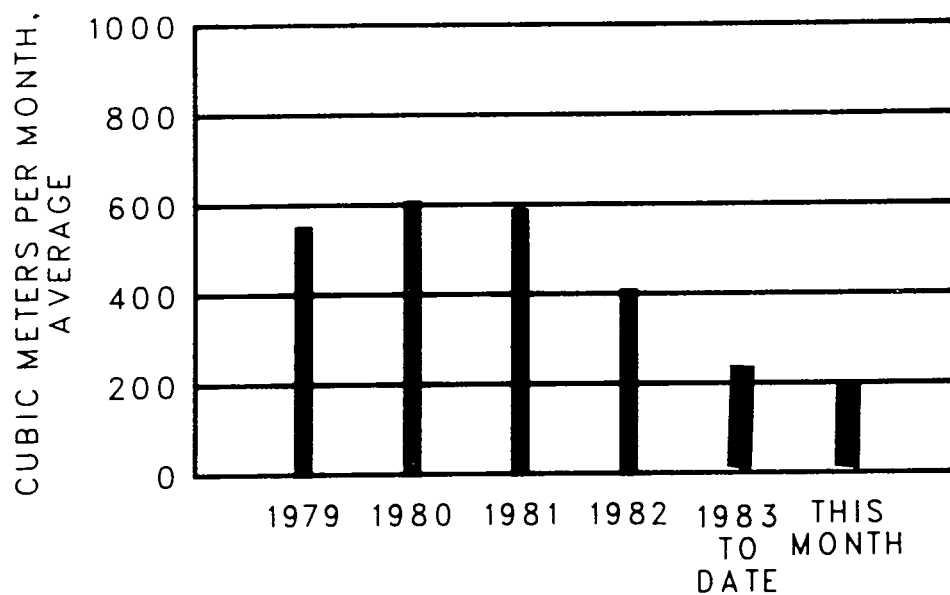


Fig. 6. Low-Level Waste Volume Generated this Month.

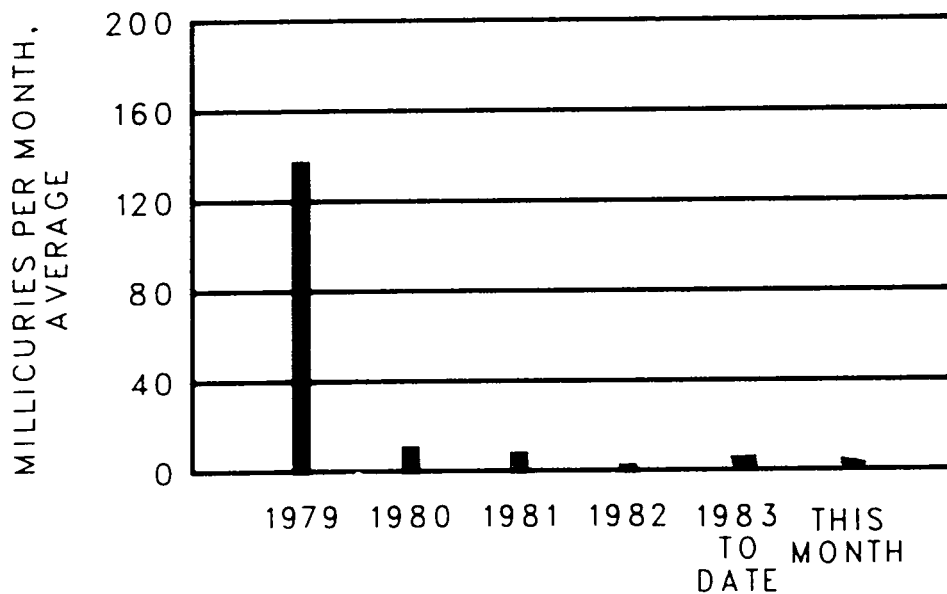


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.0501	0.167
Discharge from Melton Valley Operations and Burial Ground 5	4	0.0083	0.021
Discharge from LLW Pits and Trenches	East Weir	0.0001	-----
Discharge from LLW Pits and Burial Ground 6	West Weir	0.0001	-----
Total discharge from all sources		0.0584	0.188
White Oak Dam to Clinch River (EOS Measurements)		0.076	0.159

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	950	0.079	16.7	3.08	15.2
Radioisotopes Processing Area (MH 114 minus MH 112)	----	0.158 ^a	33.3	2.81	13.9
Reactor Operations (MH 112)	23	0.002	0.4	2.11	10.4
Buildings 3503 and 3508 (MH 229)	0.72	<0.001	----	1.84	9.1
Buildings 3025 and 3026 (MH 149)	9.8	<0.001	----	2.54	12.6
Building 3019 (MH 25)	3.2	<0.001	----	1.56	7.7
Waste Evaporator, Bldg. 2531 (MH 243)	470	0.012	2.5	0.98	4.8
Building 3525 (MH 235)	5.2	<0.001	----	0.63	3.1
Building 2026 (MH 240)	1.7	<0.001	----	1.09	5.4
Tank Farm Drainage	2300	0.223	47.1	3.59	17.8

^aThe activity entered the process-waste system with inletage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	< 0.01	1
Central Radioactive Gas Disposal Facilities	3039	< 0.01	334
Radiochemical-Processing Pilot Plant	3020	< 0.01	14
MSRE	7512	< 0.01	2
HFIR and TRU	7911	< 0.01	36
Activity in Gases Released at X-10 Site		< 0.01	387
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		54 (3 H)	
Building 4508 Ventilation Discharges Room 136 Room 265			2.54x10 ⁻³ 3.50x10 ⁻³
Building 5505 Discharges Glove Box Hood			2.25x10 ⁻³ 3.87x10 ⁻³

^aActivity primarily 131 I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNot available.

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MAR 27 1984

DATE: March 26, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF OCTOBER 1983

TO: Distribution

FROM: L. C. Lasher²¹

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

Donald H. Harris 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Gunite sludge injection SI-8 was completed October 26, 1983. The sluicing equipment was relocated from W-7 to W-8 and operations were resumed on October 3.

A total of 103 mCi of ^{90}Sr was discharged into White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 75% of this total. The Environmental and Occupational Safety Division measured a 109 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of October was 0.4% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 2.7% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.109 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 60×10^4 and $4 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 103 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.6 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.3 mCi of ^{90}Sr was released from the 190 pond system, and a total of 10.7 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (m i)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	9.6	
190 Ponds	0.3	
Process Waste Treatment Plant	0.6	
Sewage Treatment Plant	10.7	
	21.2	
7500 Sampling Station	72.8	
Burial Grounds 1 and 3 and Floodplains		51.6
Station 3	93.6	
Burial Ground 4		20.8

Melton Branch

7900 Area (HFIR and TRU)	0.2	
7500 Area (NSPP and MSRE)	4.0	
	4.2	
Station 4	9.0	
Burial Ground 5		4.8

ILW Pit Disposal Area

East Weir	0.1	
West Weir	0.2	
	0.3	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	102.9	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		77.5
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		75.3%

Process Waste

A total of $1.86 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.69 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared, to previous months is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 27 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	34	8	24.5
Volume treated (m^3)	453	180	374

Low-Level Waste

The scheduled sludge injection SI-8 was completed on October 26, 1983. A total of 742 m^3 (196,000 gal) of suspended sludge was slurried with 345,500 kg (760,000 lb) of blended cement and fly ash and pumped into the formation at a depth of 1,010 ft. Sludge injection SI-9 is scheduled for November 29, 1983.

The sluicing equipment and pumps were relocated in preparation for the sluicing of gunite tank W-8. This operation began on October 3. A total of 410 m^3 sludge/bentonite slurry was transferred to the Melton Valley Waste Storage Facility to be injected.

Both of the evaporator systems were operated in parallel intermittently during the month. The average boil-down rates for the 2A (annex) and A-2 systems were $0.55 \text{ m}^3/\text{hr}$ and $0.17 \text{ m}^3/\text{hr}$, respectively.

A summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	384.8
Volume transferred to evaporators	455.0
South Tank Farm Inventory:	
Beginning of Month	639.5
End of Month	648.0
Service Tank Inventory:	
W-21, Beginning of Month	85.9
W-21, End of Month	42.0
W-22, Beginning of Month	52.1
W-22, End of Month	25.8
W-23, Beginning of Month	134.6
W-23, End of Month	78.0
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	699.0
Total Volume at End of Month	489.9

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of ILW generated each month.

	<u>m³</u>
Transuranium Processing Area	13.0
Building 3019	26.1
Building 3525	16.2
Radioisotopes Processing Area	31.0
ORR and BSR	31.3
High Flux Isotope Reactor	32.7
Fission Products Development Laboratory	34.6*
4500 Complex	24.5
Building 3544	107.2

*The storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <2 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was 1,493 μ Ci. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.3% and 0.8%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

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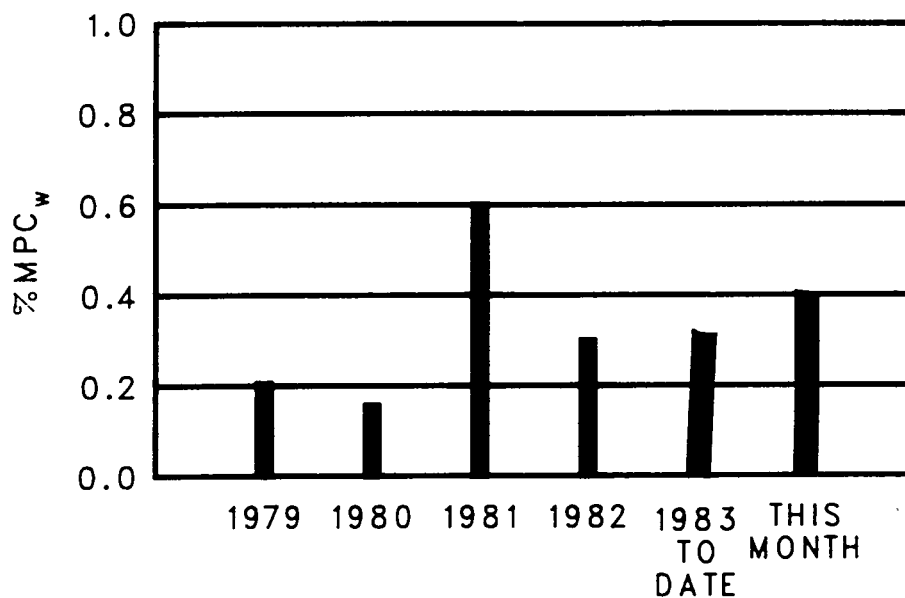


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Measurements at White Oak Dam and Assuming Complete Mixing of White Oak Creek with Clinch River).

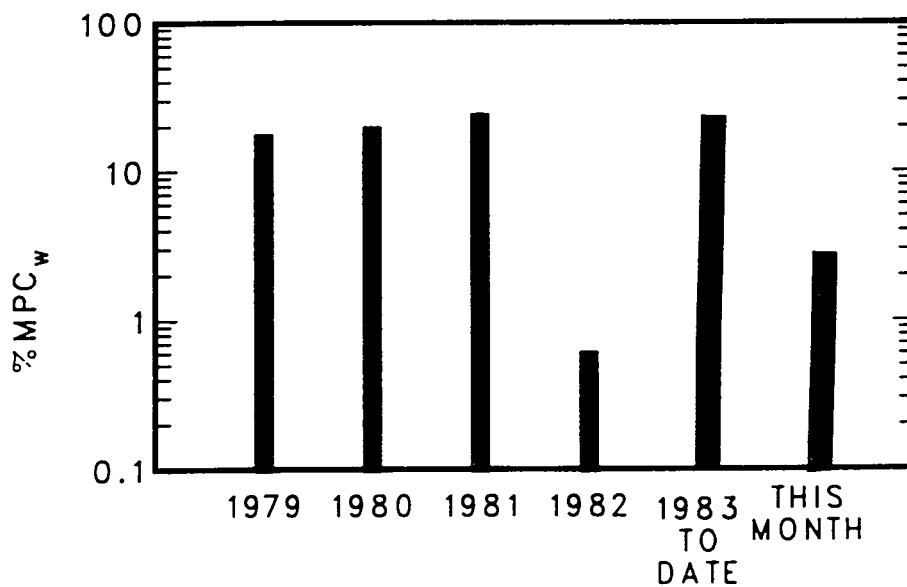


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Sampling at Confluence of White Oak Creek and the Clinch River before Appreciable Mixing has Occurred).

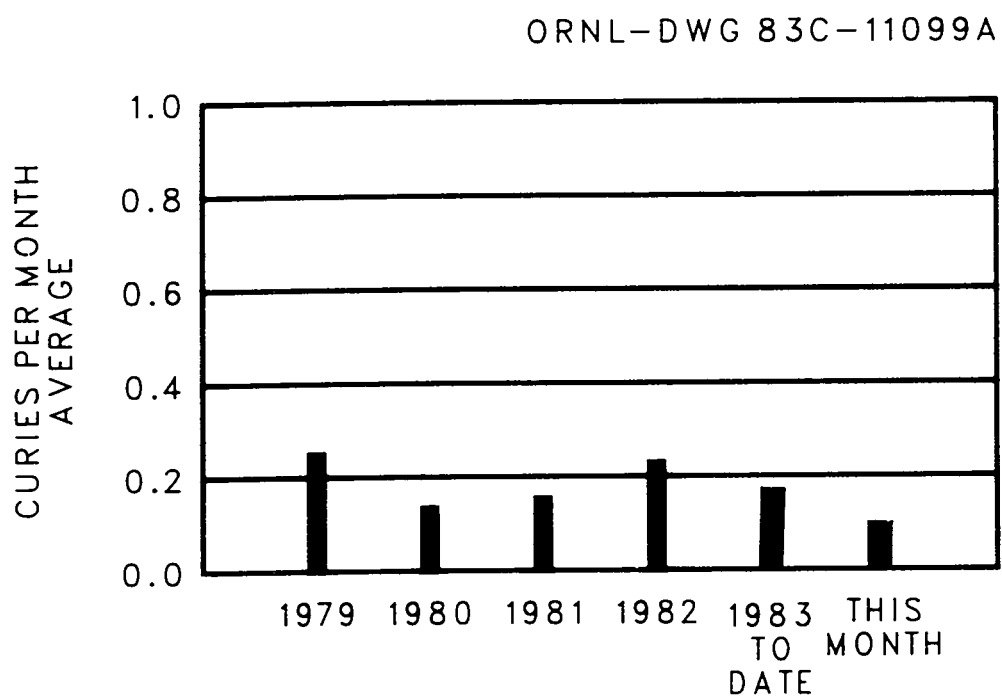


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3)

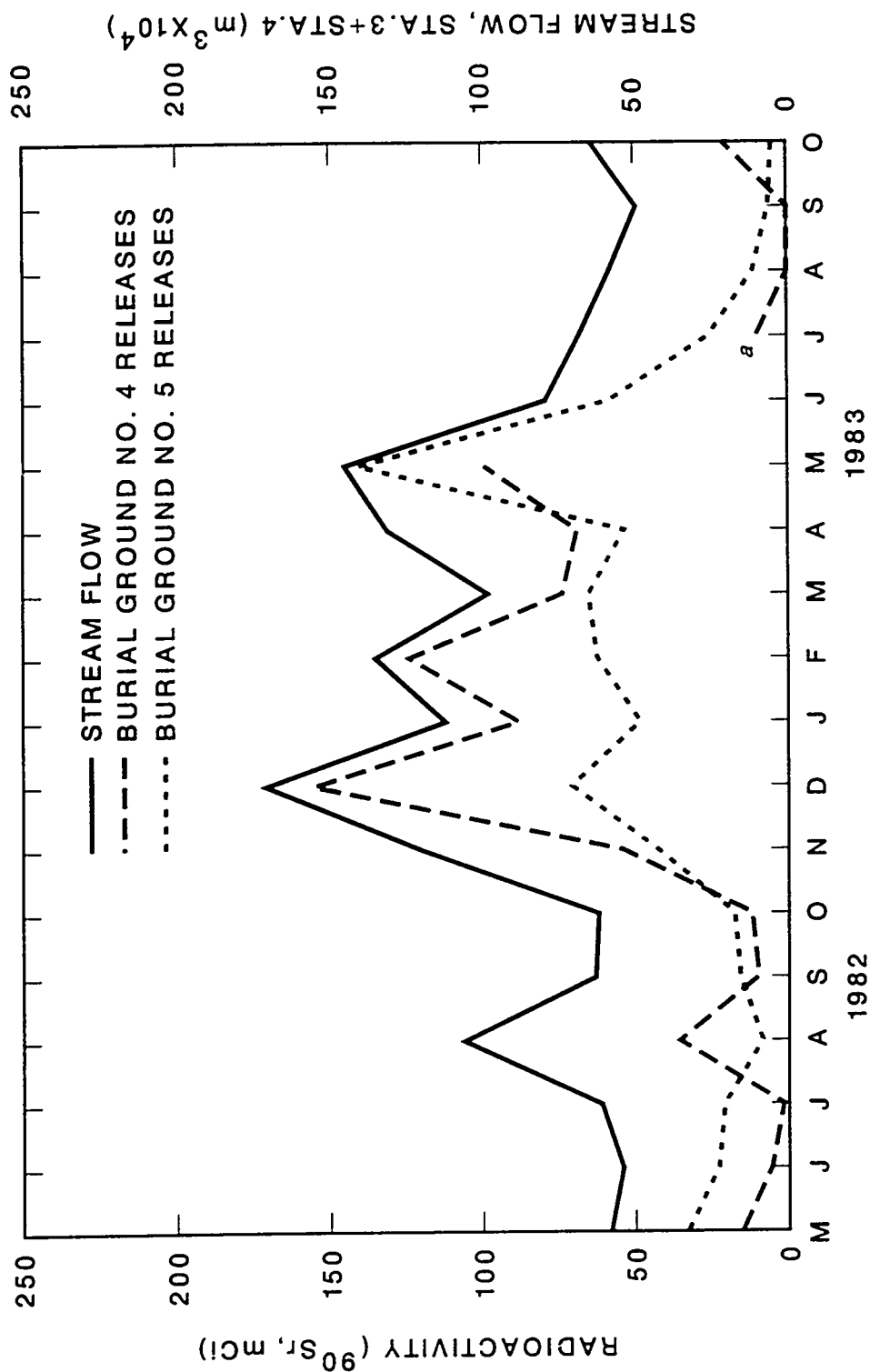


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

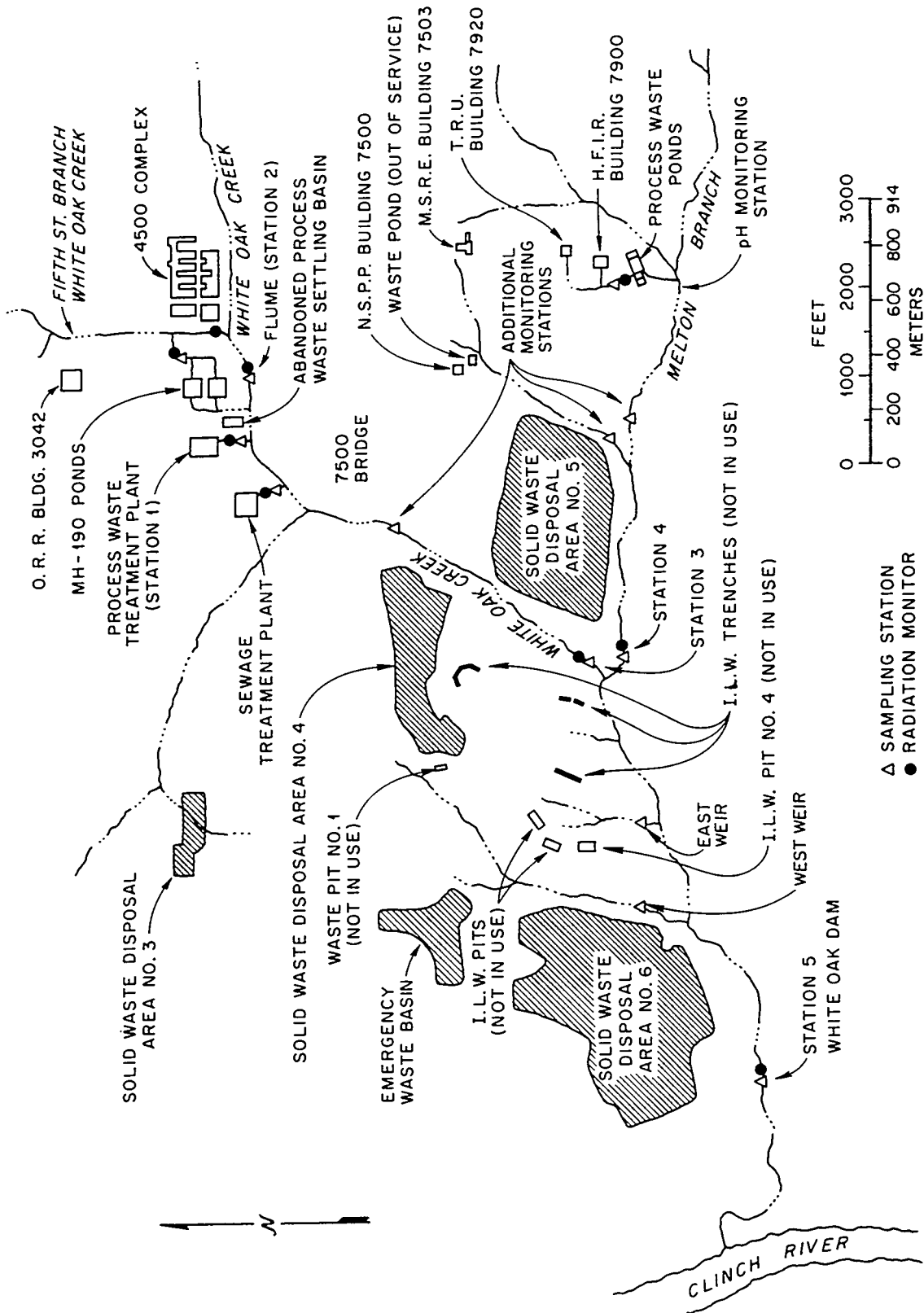


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

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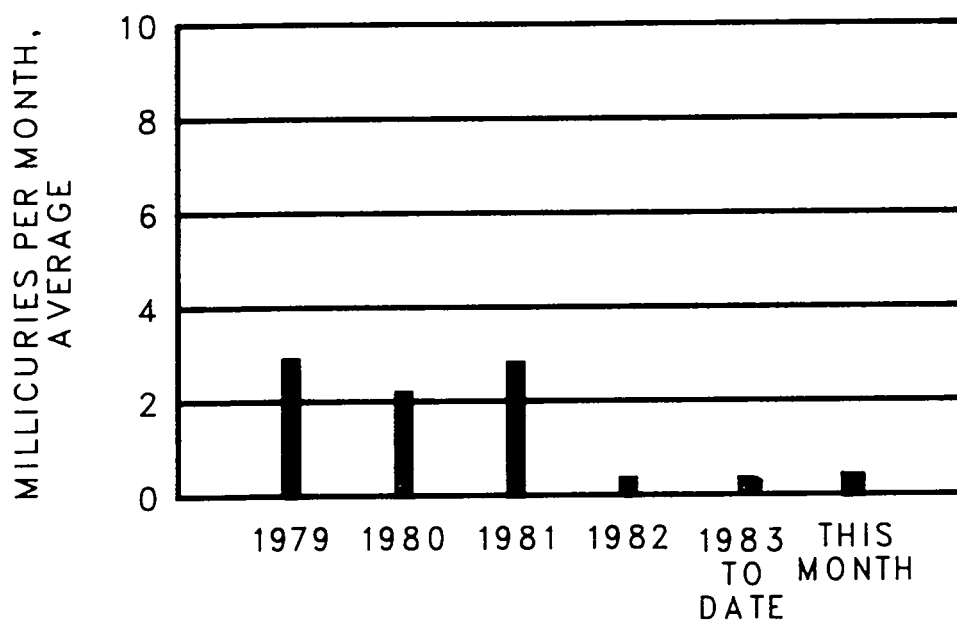


Fig. 4. ^{90}Sr Discharges in Waste to White Oak Creek.

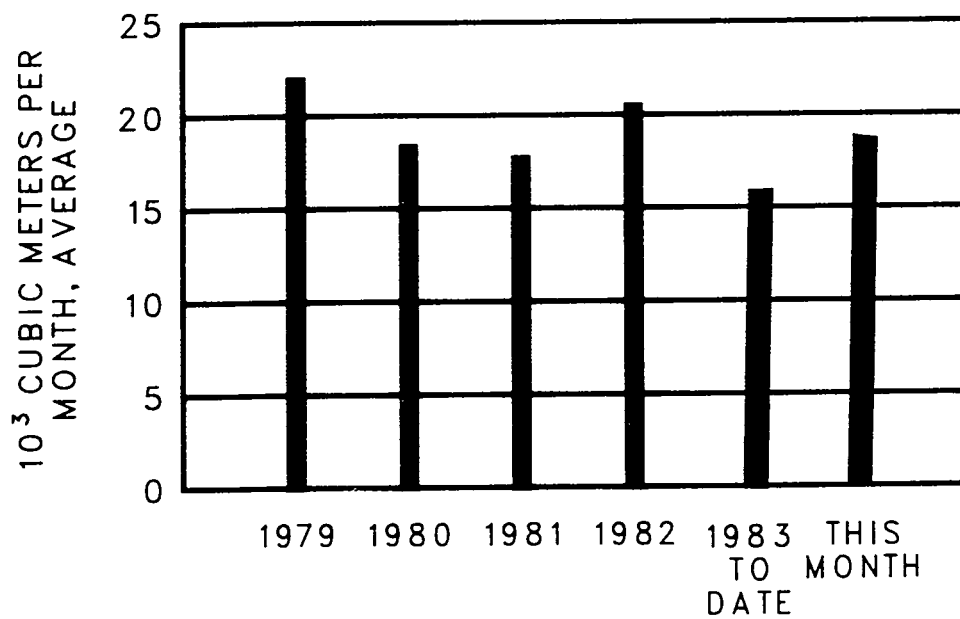


Fig. 5. Process Waste Volumes Treated in the PWTP.

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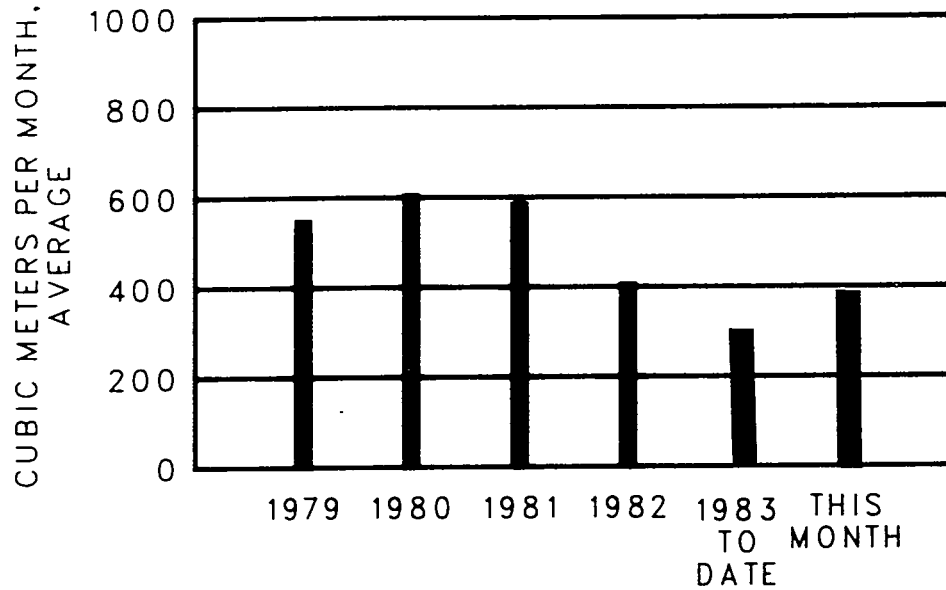


Fig. 6. Low-Level Waste Volume Generated this Month.

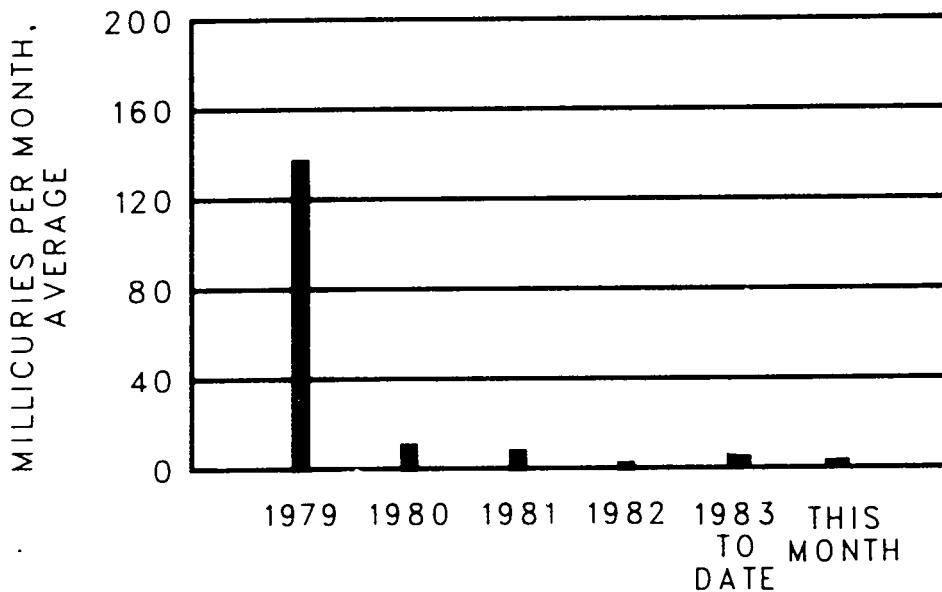


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.0501	0.167
Discharge from Melton Valley Operations and Burial Ground 5	4	0.0083	0.021
Discharge from LLW Pits and Trenches	East Weir	0.0001	-----
Discharge from LLW Pits and Burial Ground 6	West Weir	0.0001	-----
Total discharge from all sources		0.0584	0.188
White Oak Dam to Clinch River (EOS Measurements)		0.076	0.159

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Cl	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	950	0.079	16.7	3.08	15.2
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.158 ^a	33.3	2.81	13.9
Reactor Operations (MH 112)	23	0.002	0.4	2.11	10.4
Buildings 3503 and 3508 (MH 229)	0.72	<0.001	---	1.84	9.1
Buildings 3025 and 3026 (MH 149)	9.8	<0.001	---	2.54	12.6
Building 3019 (MH 25)	3.2	<0.001	---	1.56	7.7
Waste Evaporator, Bldg. 2531 (MH 243)	470	0.012	2.5	0.98	4.8
Building 3525 (MH 235)	5.2	<0.001	---	0.63	3.1
Building 2026 (MH 240)	1.7	<0.001	---	1.09	5.4
Tank Farm Drainage	2300	0.223	47.1	3.59	17.8

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HRLAL	2026	< 0.01	1
Central Radioactive Gas Disposal Facilities	3039	< 0.01	1430
Radiochemical-Processing Pilot Plant	3020	< 0.01	27
MSRE	7512	< 0.01	1
HFIR and TRU	7911	< 0.01	34
Activity in Gases Released at X-10 Site		< 0.01	1493
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		19 (³ H)	
Building 4508 Ventilation Discharges Room 136 Room 265			2.47x10 ⁻³ No sample
Building 5505 Discharges Glove Box Hood			3.60x10 ⁻³ No sample

^aActivity primarily ¹³¹I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNot available.

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ORNL/CF-84/80

DATE: March 23, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF NOVEMBER 1983

TO: Distribution

FROM: L. C. Lasher²⁷

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hamrin 7/15/90
Technical Information Officer Date
ORNL Site

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SUMMARY

There was no scheduled work at the Hydrofracture Facility. The removal of sludge from tank W-8 was completed on November 18, and the sluicing equipment was relocated from W-8 to W-9.

A total of 128 mCi of ^{90}Sr was discharged into White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 86% of this total. The Environmental and Occupational Safety Division measured a 115 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of November was 0.4% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 2.8% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.115 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 74×10^4 and $8 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 128 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.1 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.1 mCi of ^{90}Sr was released from the 190 pond system, and a total of 1.1 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	<u>^{90}Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	6.7	
190 Ponds	0.1	
Process Waste Treatment Plant	0.1	
Sewage Treatment Plant	<u>1.1</u>	
	8.0	
7500 Sampling Station	65.2	
Burial Grounds 1, 3, and Floodplains		57.2
Station 3	102.7	
Burial Ground 4		37.5

Melton Branch

7900 Area (HFIR and TRU)	0.5	
7500 Area (NSPP and MSRE)	<u>10.0</u>	
	10.5	
Station 4	25.0	
Burial Ground 5		14.5

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>0.2</u>	
	0.3	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	128.0	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		109.5
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		85.6%

Process Waste

A total of $1.84 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.66 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 34 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	30.5	21.0	25.4
Volume treated (m^3)	650	400	522

Low-Level Waste

The sluicing of gunite tank W-8 was finished on November 18. The equipment and pumps were then relocated in preparation for the sluicing of gunite tank W-9. A total of 712 m^3 of sludge slurry was transferred to the Melton Valley Waste Storage Facility to be injected.

Both of the evaporator systems were operated during the reporting period. The average boildown rate was $1.04 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	289.8
Volume transferred to evaporators	430.2
South Tank Farm Inventory:	
Beginning of Month	722.8
End of Month	566.6
Service Tank Inventory:	
W-21, Beginning of Month	42.0
W-21, End of Month	18.6
W-22, Beginning of Month	54.3
W-22, End of Month	20.5
W-23, Beginning of Month	78.0
W-23, End of Month	121.0
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	479.5
Total Volume at End of Month	1,010.3

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of LLW generated each month.

	<u>3</u> <u>m</u>
Transuranium Processing Area	19.1
Building 3019	28.5
Building 3525	6.7
Radioisotopes Processing Area	11.6
ORR and BSR	68.2
High Flux Isotope Reactor	48.9
Fission Products Development Laboratory	20.5 ^a
4500 Complex	28.4
Building 3544	46.3

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <2 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was 1,054 Ci. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.1% and 2.3%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

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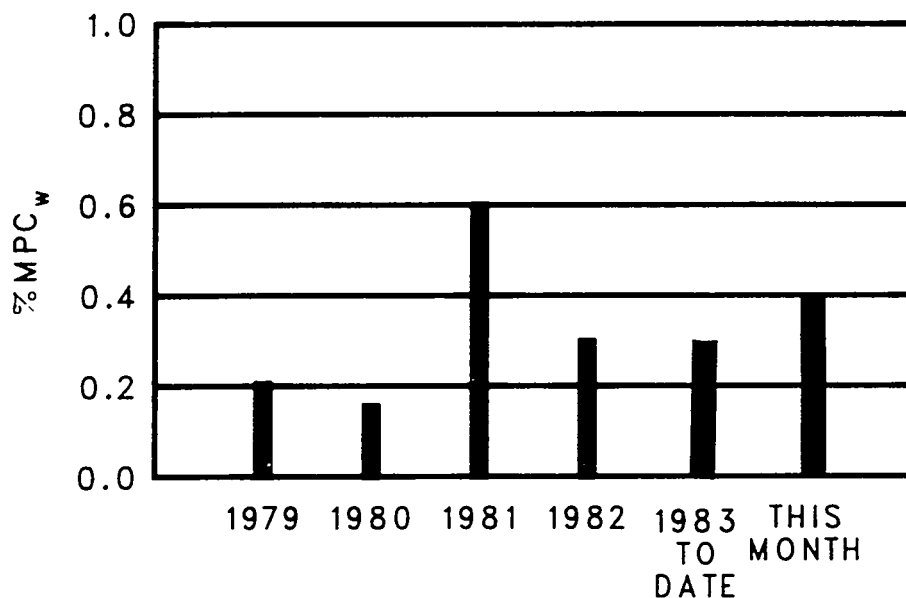


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Measurements at White Oak Dam and Assuming Complete Mixing of White Oak Creek with Clinch River).

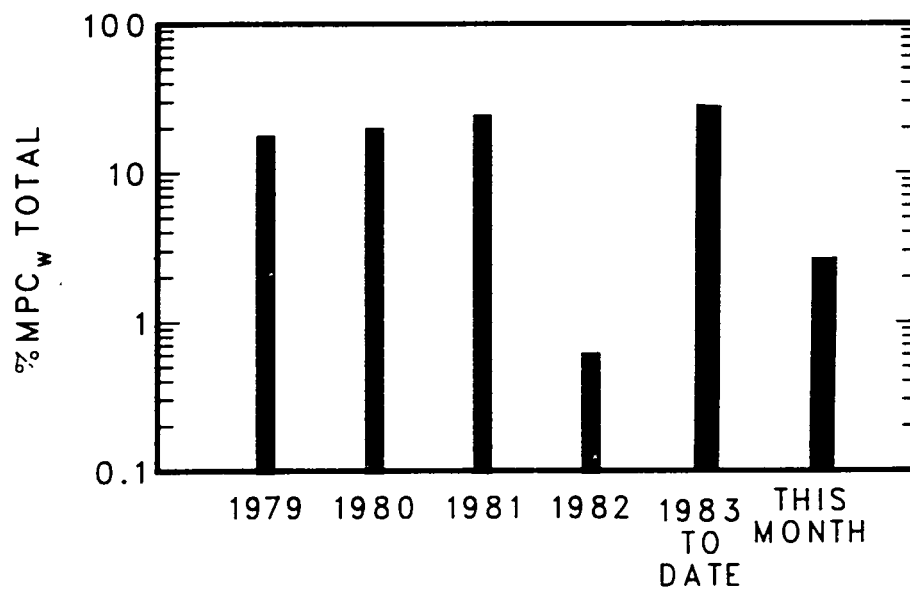


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Sampling at Confluence of White Oak Creek and the Clinch River before Appreciable Mixing has Occurred).

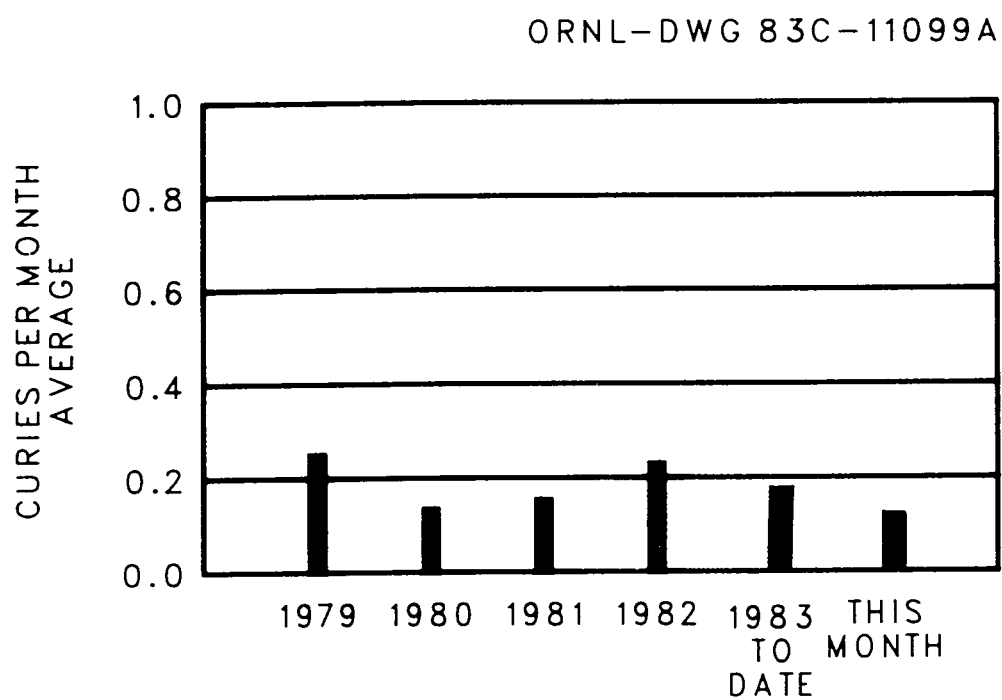


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3)

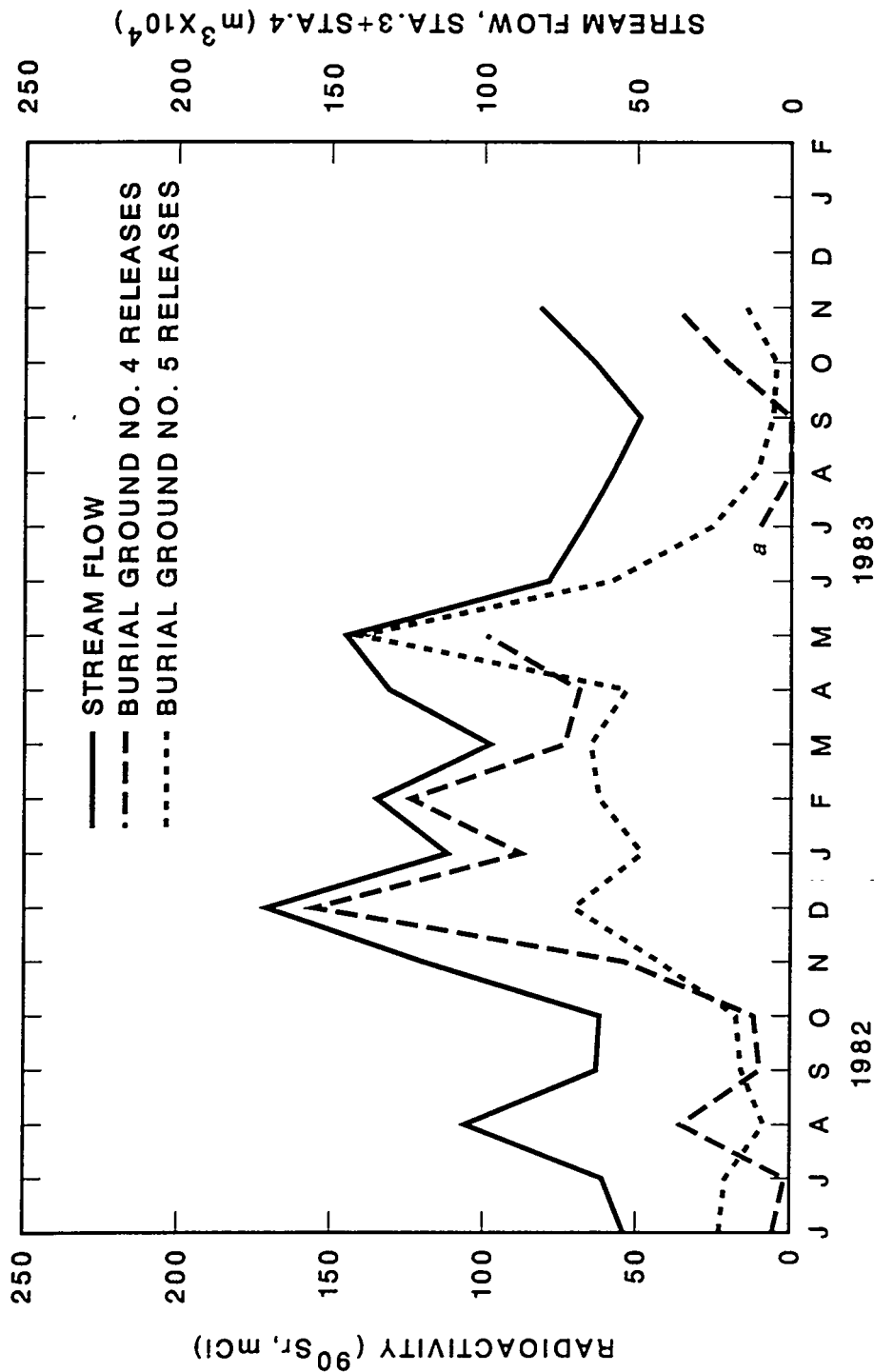


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

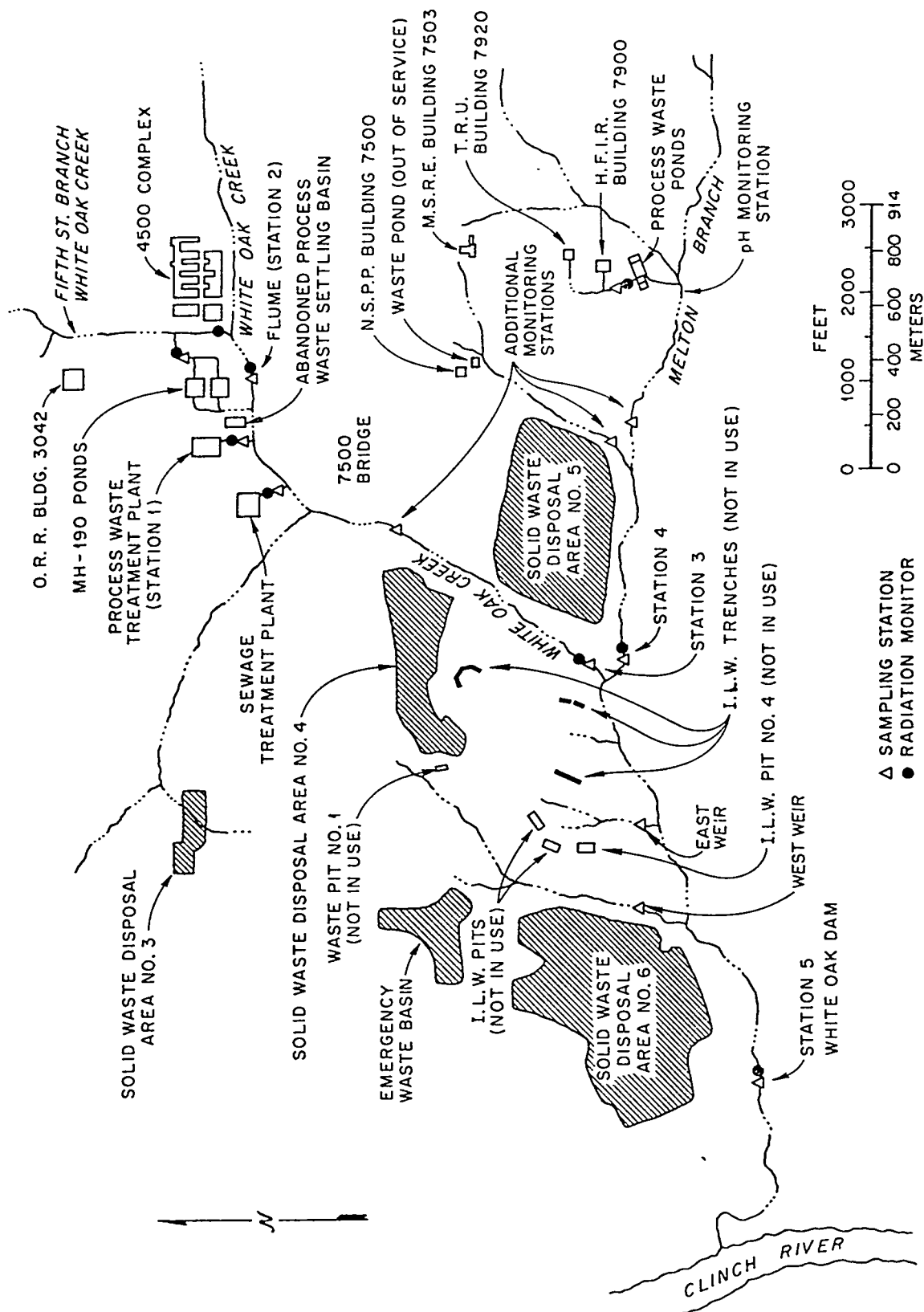


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

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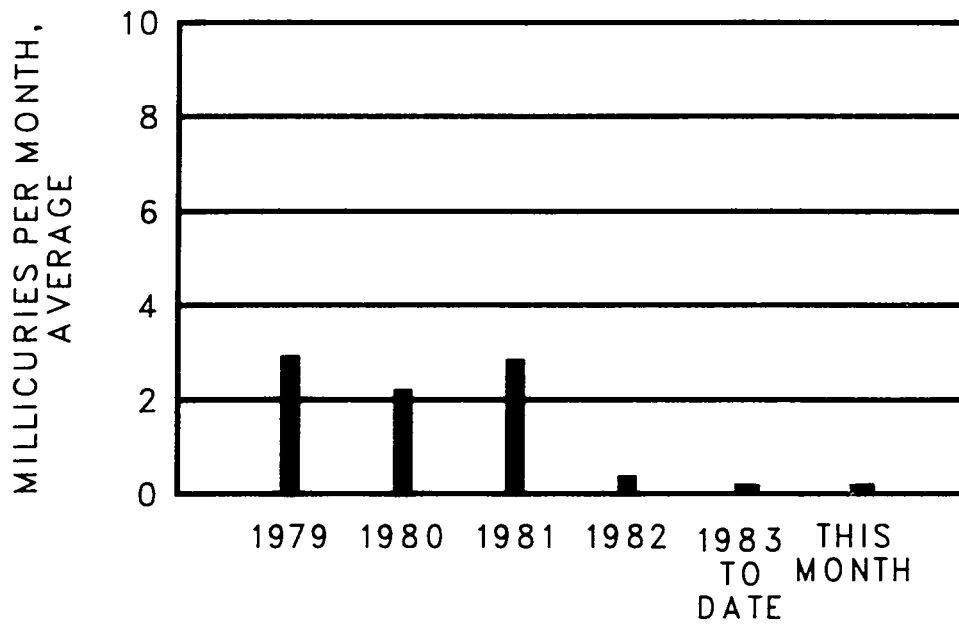


Fig. 4. ^{90}Sr Discharges in Waste to White Oak Creek.

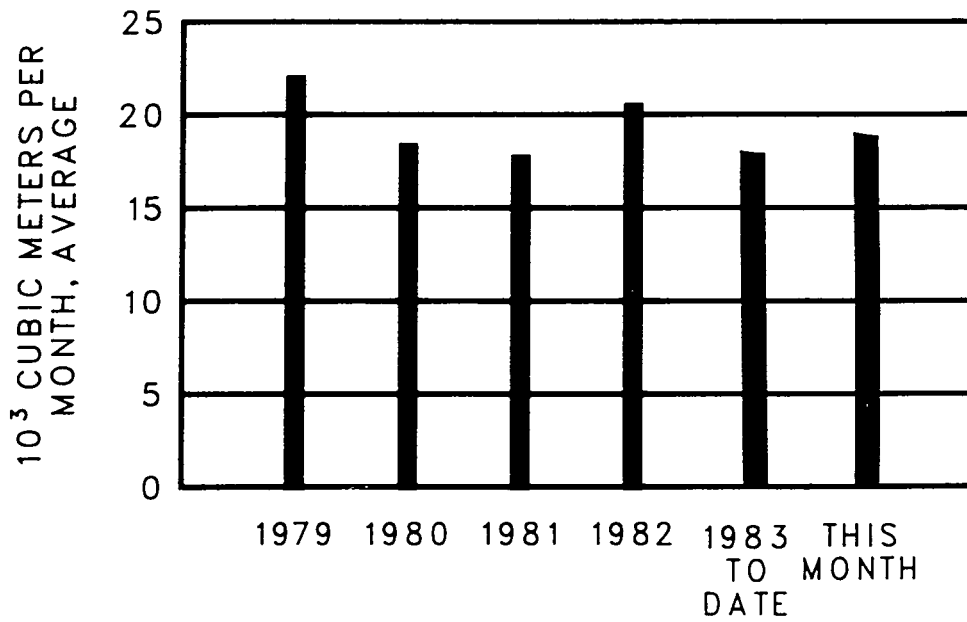


Fig. 5. Process Waste Volumes Treated in the PWTP.

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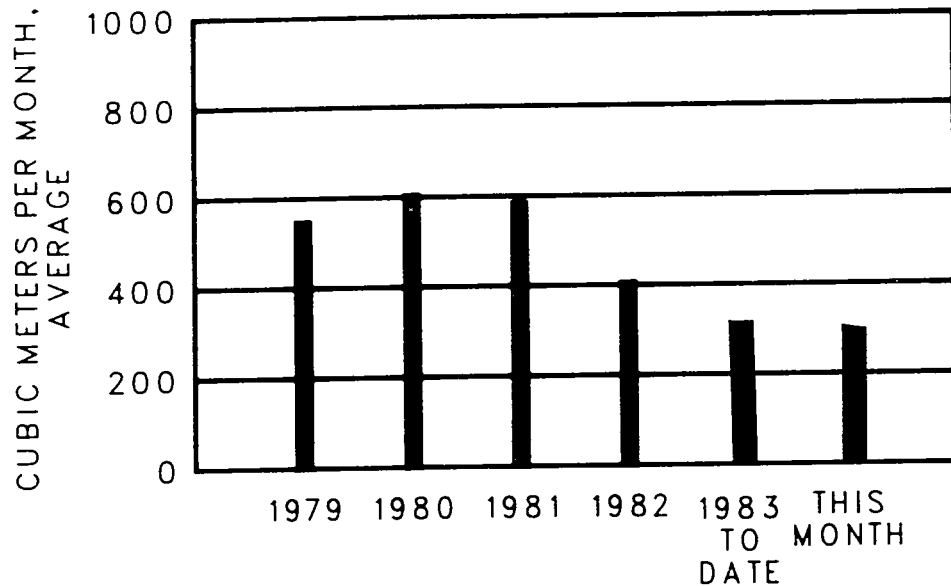


Fig. 6. Low-Level Waste Volume Generated this Month.

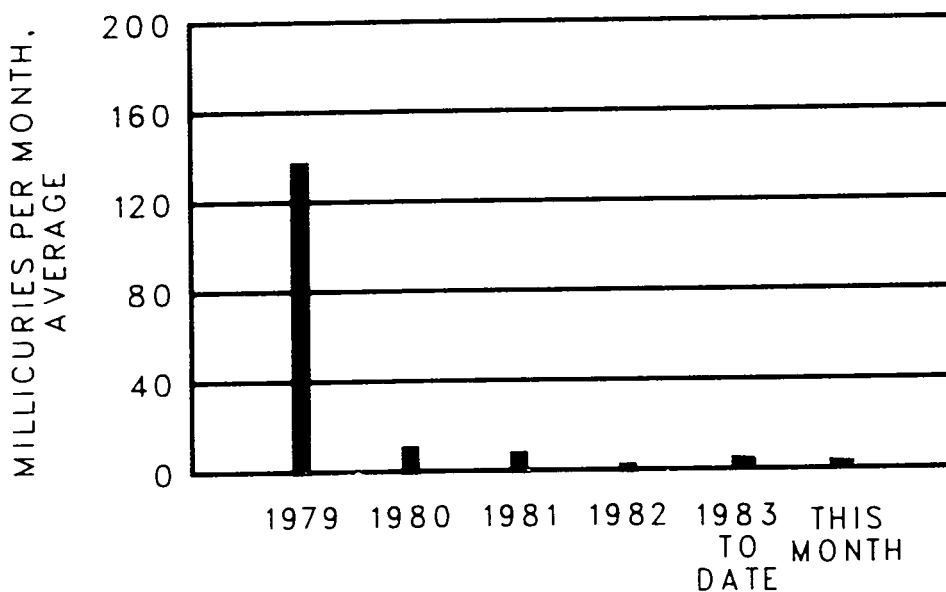


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.1027	0.242
Discharge from Melton Valley Operations and Burial Ground 5	4	0.0250	0.059
Discharge from LLW Pits and Trenches	East Weir	0.0001	-----
Discharge from LLW Pits and Burial Ground 6	West Weir	0.0002	-----
Total discharge from all sources		0.1279	0.301
White Oak Dam to Clinch River (EOS Measurements)		0.115	0.302

^aRefers to Figure 3.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	1203	0.127	17.9	3.90	14.8
Radioisotopes Processing Area (MH 114 minus MH 112)	----	0.228 ^a	32.2	1.28	4.9
Reactor Operations (MH 112)	43	0.005	0.7	4.47	17.0
Buildings 3503 and 3508 (MH 229)	1.0	<0.001	----	2.41	9.2
Buildings 3025 and 3026 (MH 149)	6.8	<0.001	----	2.60	9.8
Building 3019 (MH 25)	5.4	<0.001	----	2.44	9.3
Waste Evaporator, Bldg. 2531 (MH 243)	710	0.042	5.9	2.21	8.4
Building 3525 (MH 235)	0.88	<0.001	----	0.85	3.2
Building 2026 (MH 240)	6.6	<0.001	----	1.22	4.6
Tank Farm Drainage	2300	0.306	43.3	4.93	18.7

^aThe activity entered the process-waste system with inletage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	< 0.01	≤ 5
Central Radioactive Gas Disposal Facilities	3039	< 0.01	≤ 656
Radiochemical-Processing Pilot Plant	3020	< 0.01	≤ 23
MSRE	7512	< 0.01	< 1
HFIR and TRU	7911	< 0.01	≤ 370
Activity in Gases Released at X-10 Site		< 0.01	≤ 1054
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		2 (^3H)	
Building 4508 Ventilation Discharges Room 136 Room 265			3.09×10^{-3} No sample
Building 5505 Discharges Glove Box Hood			No sample 7.75×10^{-3}

^aActivity primarily ^{131}I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNot available.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-84/81

ORNL
MASTER COPY

DATE: March 29, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF DECEMBER 1983

TO: Distribution

FROM: L. C. Lasher ²⁷

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

Daniel E. Hamrick 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Gunite sludge injection SI-9 was completed December 2, 1983. The removal of sludge from tank W-9 was completed on December 14. The sluicing equipment was relocated from W-9 to W-10, and sluicing operations were resumed on December 21, 1983.

A total of 341 mCi of ^{90}Sr was discharged to White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 92% of this total. The Environmental and Occupational Safety Division measured a 370 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as ^{131}I ; the total release was less than 30 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of December was 0.6% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 21.1% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.370 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 60×10^4 and 4×10^4 m³, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 341 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.3 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.2 mCi of ^{90}Sr was released from the 190 pond system, and a total of 15.9 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	2.0	
190 Ponds	0.2	
Process Waste Treatment Plant	0.3	
Sewage Treatment Plant	15.9	
	18.4	
7500 Sampling Station	121.3	
Burial Grounds 1 and 3 and Floodplains		102.9
Station 3	297.7	
Burial Ground 4		176.4

Melton Branch

7900 Area (HFIR and TRU)	<0.1	
7500 Area (NSPP and MSRE)	7.6	
	7.6	
Station 4	43.0	
Burial Ground 5		35.4

LLW Pit Disposal Area

East Weir	<0.01	
West Weir	<0.01	
	<0.02	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	340.7	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		314.7
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		92.4%

Process Waste

A total of $2.04 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.92 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 39 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	34	20	25
Volume treated (m^3)	773	391	525

Low-Level Waste

The scheduled sludge injection SI-9 was completed on December 2, 1983. A total of 721 m^3 (190,600 gal) of suspended sludge was slurried with 348,500 kg (766,700 lb) of blended cement and fly ash and pumped into the formation at a depth of 1,010 ft. Sludge injection SI-10 is scheduled for January 23, 1984.

The sluicing of gunite tank W-9 was finished on December 14. The equipment and pumps were then relocated in preparation for the sluicing of gunite tank W-10. This operation began on December 21. A total of 331 m^3 of resuspended sludge and 114 m^3 of LLW were transferred to the Melton Valley Waste Storage Facility to be injected.

Both of the evaporator systems were operated in parallel during the month. The average boil-down rate was $0.63 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	449.2
Volume transferred to evaporators	468.6
South Tank Farm Inventory:	
Beginning of Month	526.0
End of Month	266.0
Service Tank Inventory:	
W-21, Beginning of Month	18.6
W-21, End of Month	31.8
W-22, Beginning of Month	20.5
W-22, End of Month	28.4
W-23, Beginning of Month	121.0
W-23, End of Month	60.0
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	1,193.0
Total Volume at End of Month	950.0

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of LLW generated each month.

	<u>³ m</u>
Transuranium Processing Area	8.9
Building 3019	53.9
Building 3525	12.0
Radioisotopes Processing Area	20.8
ORR and BSR	131.0
High Flux Isotope Reactor	55.8
Fission Products Development Laboratory	32.6 ^a
4500 Complex	18.1
Building 3544	84.3

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <30 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was 48 μ Ci. Inert gases released from the 3039 and 7911 Stacks averaged less than 0.4% and 0.3%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

ORNL-DWG 83C-11098A

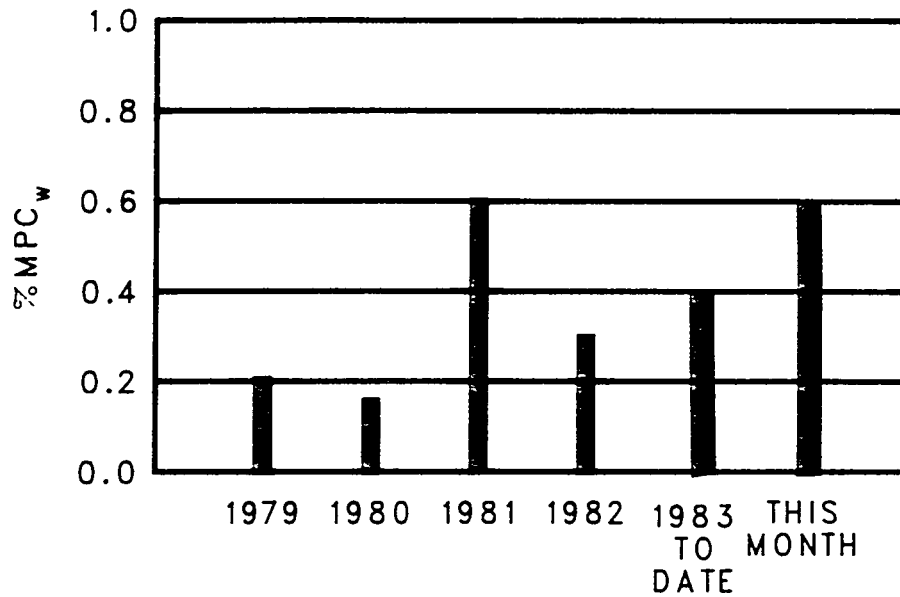


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Measurements at White Oak Dam and Assuming Complete Mixing of White Oak Creek with Clinch River).

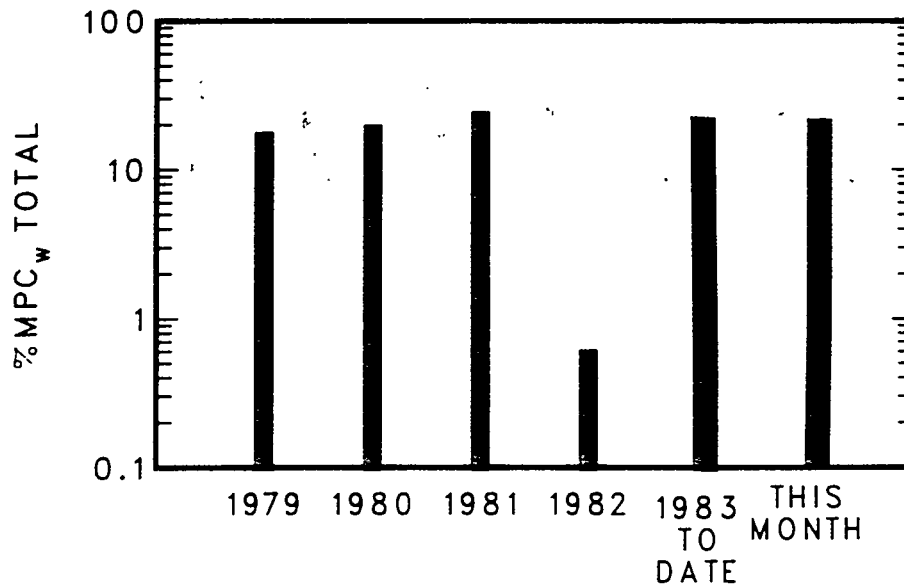


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Sampling at Confluence of White Oak Creek and the Clinch River Before Appreciable Mixing Has Occurred).

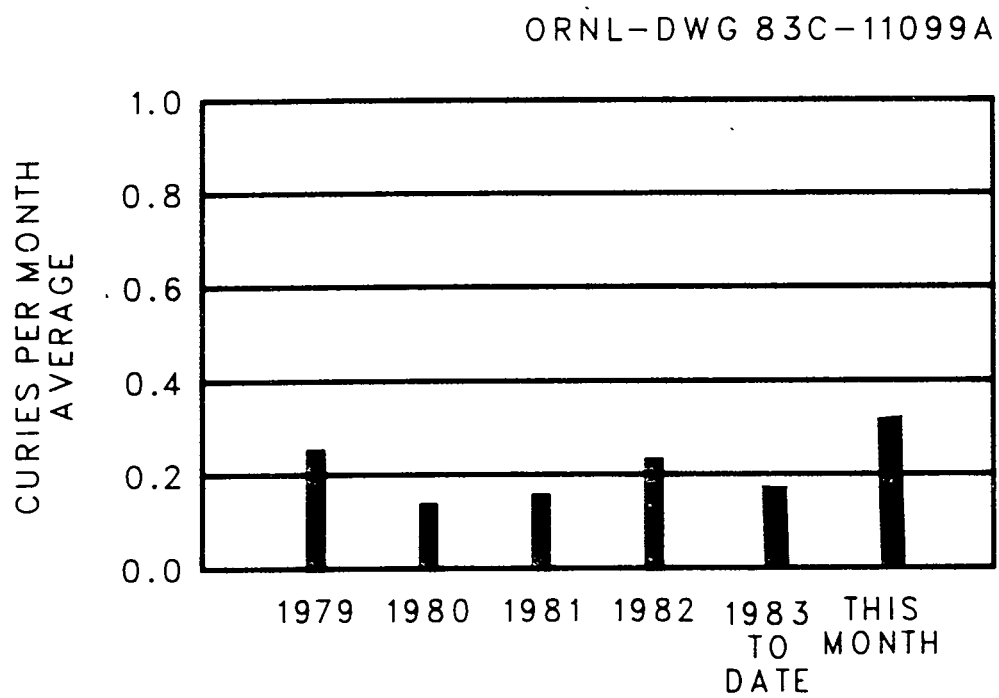


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3).

ORNL-DWG 84C-8672

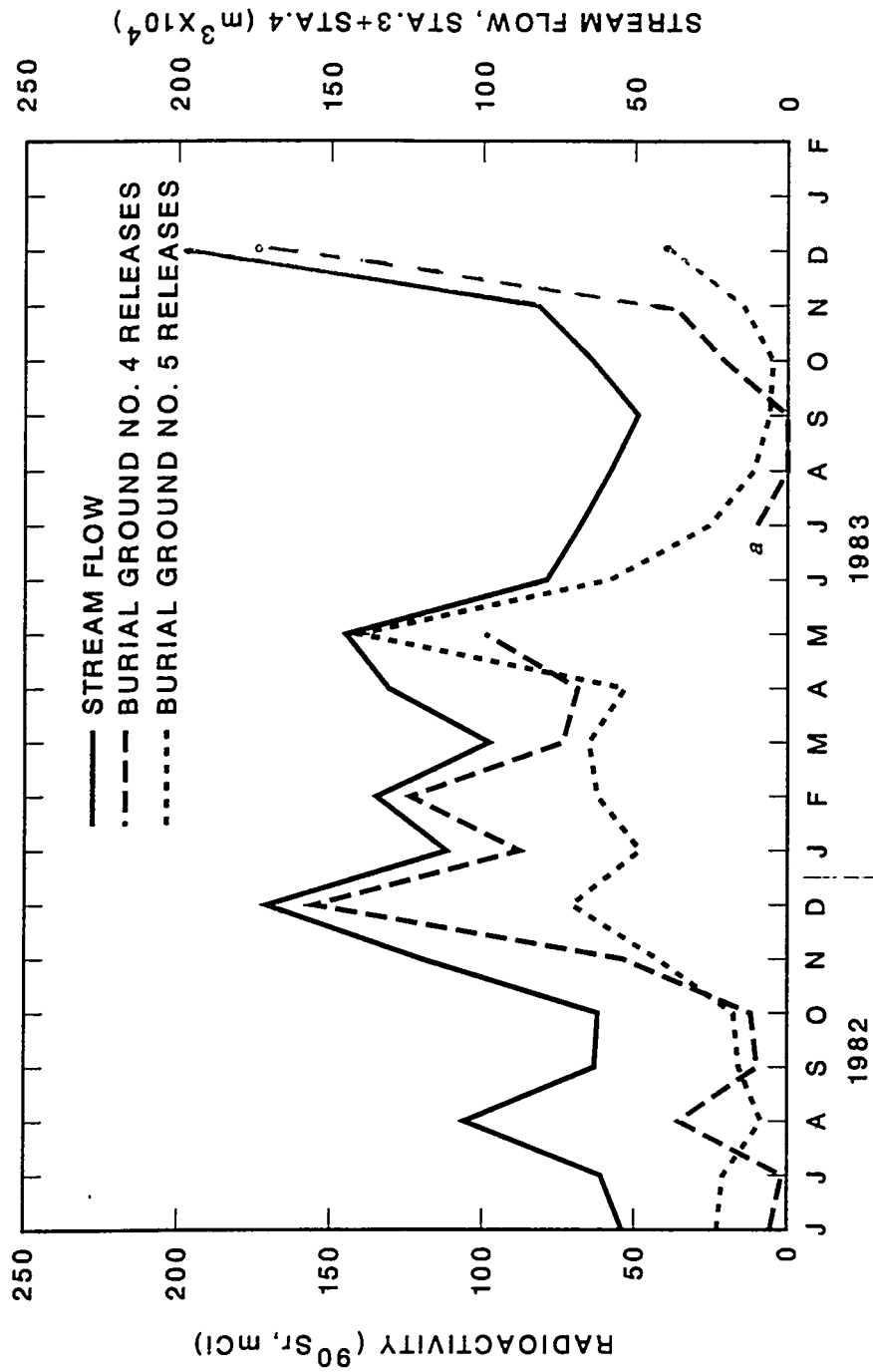
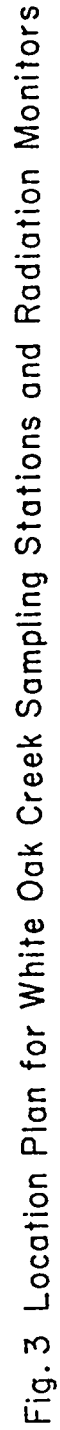


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.



ORNL-DWG 83C-11100A

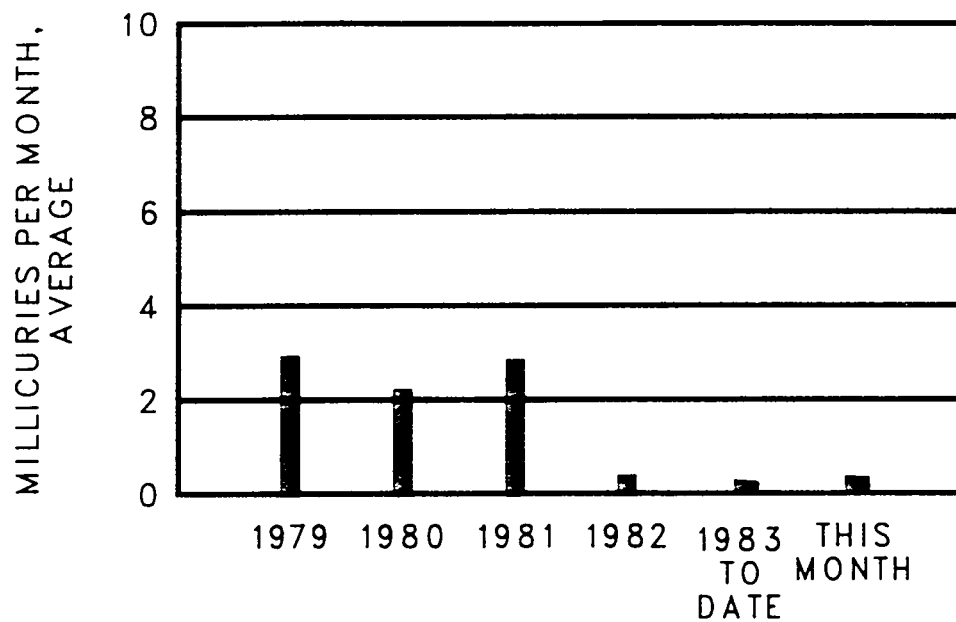


Fig. 4. ^{90}Sr Discharges in Waste to White Oak Creek.

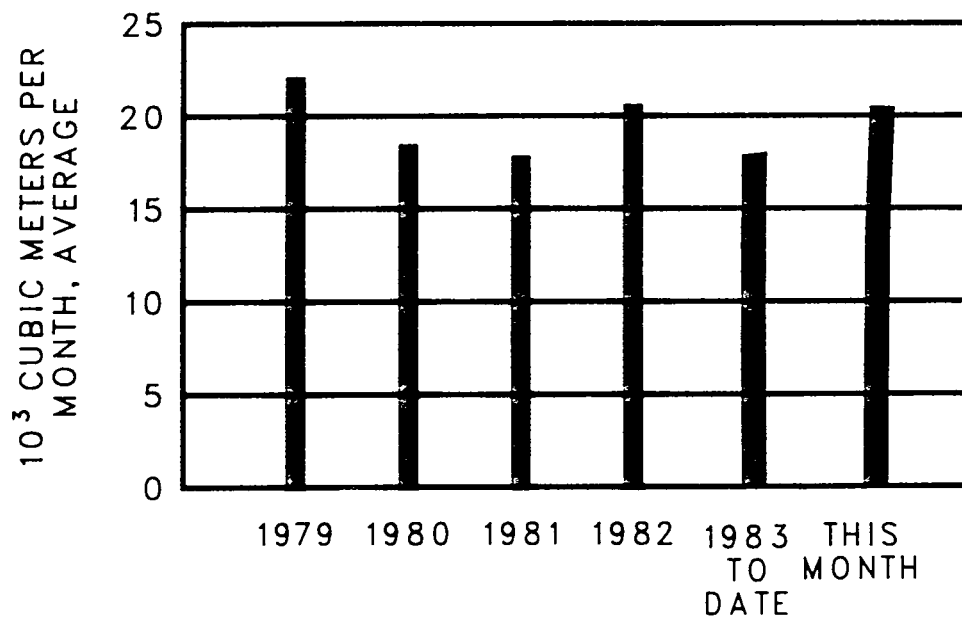


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101A

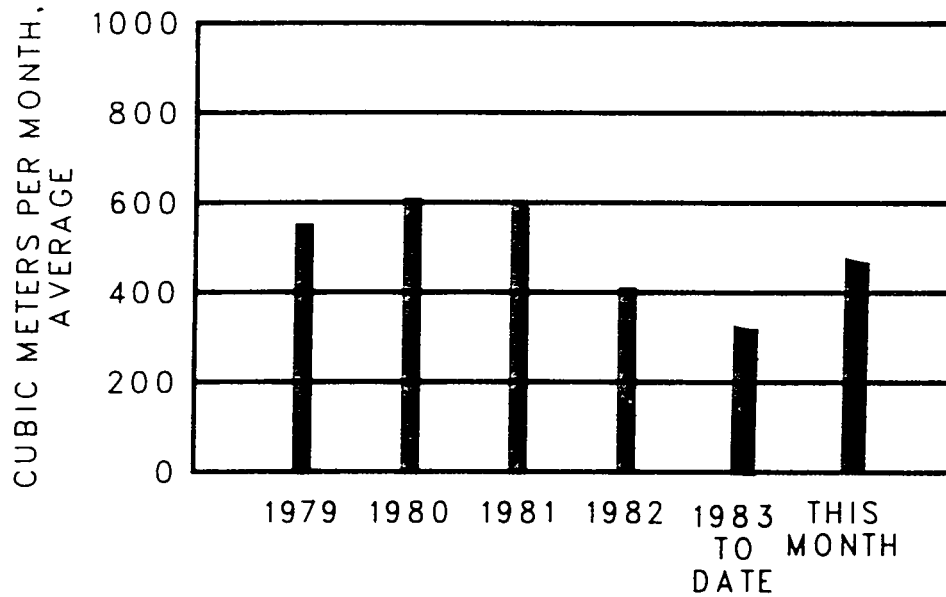


Fig. 6. Low-Level Waste Volume Generated this Month.

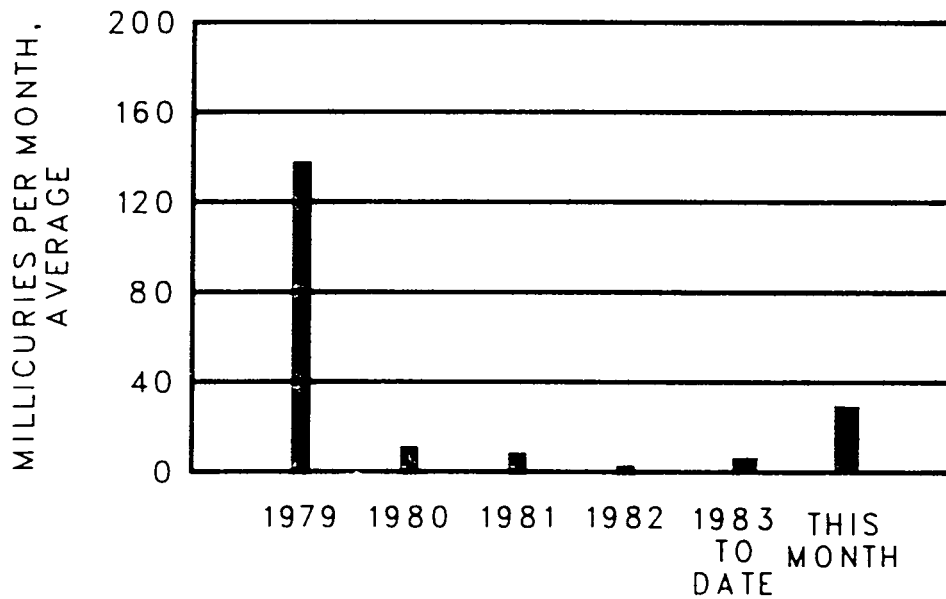


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level Is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.0298	0.822
Discharge from Melton Valley Operations and Burial Ground 5	4	0.043	0.093
Discharge from LLW Pits and Trenches	East Weir	0.0001	-----
Discharge from LLW Pits and Burial Ground 6	West Weir	0.0001	-----
Total Discharge from All Sources		0.341	0.915
White Oak Dam to Clinch River (EOS Measurements)		0.370	0.870

^aRefers to Fig. 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	1800	0.193	20.7	3.97	13.9
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.236 ^a	25.2	1.59	5.5
Reactor Operations (MH 112)	37	0.005	0.5	5.26	18.4
Buildings 3503 and 3508 (MH 229)	4	<0.001	---	2.57	9.0
Buildings 3025 and 3026 (MH 149)	11	<0.001	---	2.66	9.3
Building 3019 (MH 25)	14.0	<0.001	---	1.62	5.6
Waste Evaporator, Bldg. 2531 (MH 243)	650	0.039	4.2	2.22	7.8
Building 3525 (MH 235)	3.6	<0.001	---	1.02	3.6
Building 2026 (MH 240)	0.49	<0.001	---	1.34	4.7
Tank Farm Drainage	2700	0.462	44.4	6.34	22.2

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HRLAL	2026	< 0.01	< 1
Central Radioactive Gas Disposal Facilities	3039	< 0.03	34
Radiochemical-Processing Pilot Plant	3020	< 0.01	1
MSRE	7512	< 0.01	< 0.01
HFIR and TRU	7911	< 0.01	13
Activity in Gases Released at X-10 Site		< 0.03	48
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		60 (^3H)	---
Building 4508 Ventilation Discharges Room 136 Room 265			3.1×10^{-4} No sample
Building 5505 Discharges Glove Box Hood			No sample 7.75×10^{-3}

^aActivity primarily ^{131}I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

DATE ISSUED JUN 15 1984

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ORNL/CF-84/ 244

DATE: May 10, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF JANUARY 1984

TO: Distribution

FROM: L. C. Lasher

Sponsor: J. H. Swanks¹

This document has been approved for release
to the public by:

Daniel R. Humm 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

The Guniting Tank Sludge Disposal Project was completed January 27 when slurried sludge from tank W-10 was pumped into the shale formation at the hydrofracture facility.

The scheduled injection SI-10 was completed January 28.

One unusual occurrence was reported during the period. (Report No. ORNL-84-12-OP-84-3). A high-level safety limit was violated when collection tank WC-14 was filled to overflowing.

A total of 159 mCi of ^{90}Sr was discharged into White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 83% of this total. The Environmental and Occupational Safety Division measured a 169 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. Approximately 37 mCi of activity was emitted with the gaseous waste from the ORNL stacks. About 10% of this contamination was identified as ^{131}I ; the balance was a mixture of fission products.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of January was 0.4% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 36.7% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.169 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 73×10^4 and $19 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 159 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.6 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.8 mCi of ^{90}Sr was released from the 190 pond system, and a total of 11.9 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and from Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	8.6	
190 Ponds	0.8	
Process Waste Treatment Plant	0.6	
Sewage Treatment Plant	<u>11.9</u>	
	21.9	
7500 Sampling Station	61.9	
Burial Grounds 1, 3, and Floodplains		40.0
Station 3	103.2	
Burial Ground 4		41.3

Melton Branch

7900 Area (HFIR and TRU)	0.4	
7500 Area (NSPP and MSKE)	<u>4.0</u>	
	4.4	
Station 4	51.7	
Burial Ground 5		47.3

LLW Pit Disposal Area

East Weir	<0.1	
West Weir	<u>3.6</u>	
	3.6	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	158.5	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		132.2
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		83.4%

Process Waste

A total of $1.85 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.76 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 35 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	33.0	19.0	26.0
Volume treated (m^3)	636	431	528

Low-Level Waste

The removal of sludge from the Guniting Tank W-10 was completed on January 23, and, subsequently, the GTSR project was completed when this material was pumped into the shale formation at the Hydrofracture Facility. Operating equipment at the project site has been placed in standby, and the area will remain inactive for the remainder of the fiscal year.

The scheduled sludge/LLW injection SI-10 was completed January 28. A total of 700 m^3 (185,000 gal) of suspended sludge and 462 m^3 (122,000 gal) of LLW were slurried with 704,000 kg (1,459,000 lb) of blended cement and flyash and pumped into the formation at a depth of 1,010 ft. The slot was plugged with cement.

Both of the evaporator systems were operated during the reporting period. The average boildown rate was $0.56 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	337.9
Volume transferred to evaporators	414.7
South Tank Farm Inventory:	
Beginning of Month	266.0
End of Month	261.0
Service Tank Inventory:	
W-21, Beginning of Month	31.8
W-21, End of Month	25.2
W-22, Beginning of Month	28.4
W-22, End of Month	20.5
W-23, Beginning of Month	60.0
W-23, End of Month	51.9
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	950.0
Total Volume at End of Month	226.0

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of LLW generated each month.

	<u>m³</u>
Transuranium Processing Area	8.0
Building 3019	39.0
Building 3525	11.6
Radioisotopes Processing Area	18.0
ORR and BSR	51.1
High Flux Isotope Reactor	77.4
Fission Products Development Laboratory	42.7 ^a
4500 Complex	21.8
Building 3544	42.5

^a The storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <37 mCi of gaseous ¹³¹I this month. The amount of radioactive particulates released during the period was 14 Ci. Inert gases released from the 3039 and 7911 Stacks averaged less than 6.9% and 1.2%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

Unusual Occurrence

Unusual Occurrence Report ORNL-84-12-OP-84-3, "Violation of a Low-Level Waste System Safety Limit."

A safety limit for the LLW system was violated when waste collection tank WC-14 was filled to overflowing. This occurred when repairmen who were evaluating an unrelated problem inadvertently started a sump pump which filled the tank. No release of radioactivity to the environment, and no personnel exposures occurred. System design allows WC-14 to overflow into an adjacent collection tank.

ORNL-DWG 83C-11098A

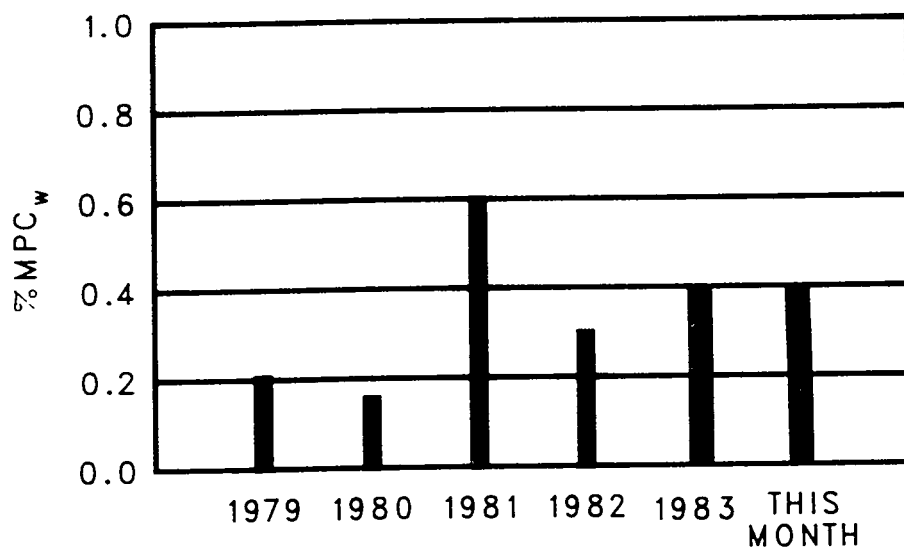


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Measurements at White Oak Dam and Assuming Complete Mixing of White Oak Creek with Clinch River).

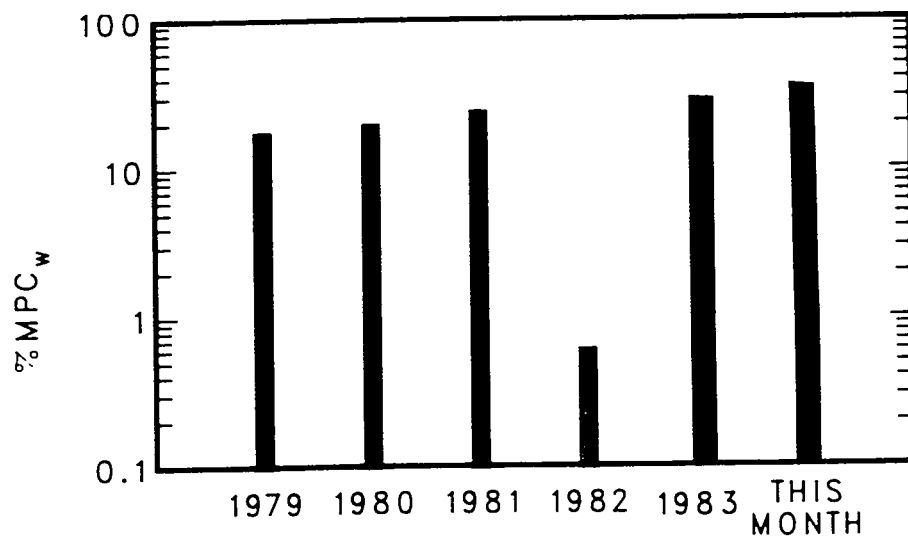


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (Based on EOS Sampling at Confluence of White Oak Creek and the Clinch River Before Appreciable Mixing Has Occurred).

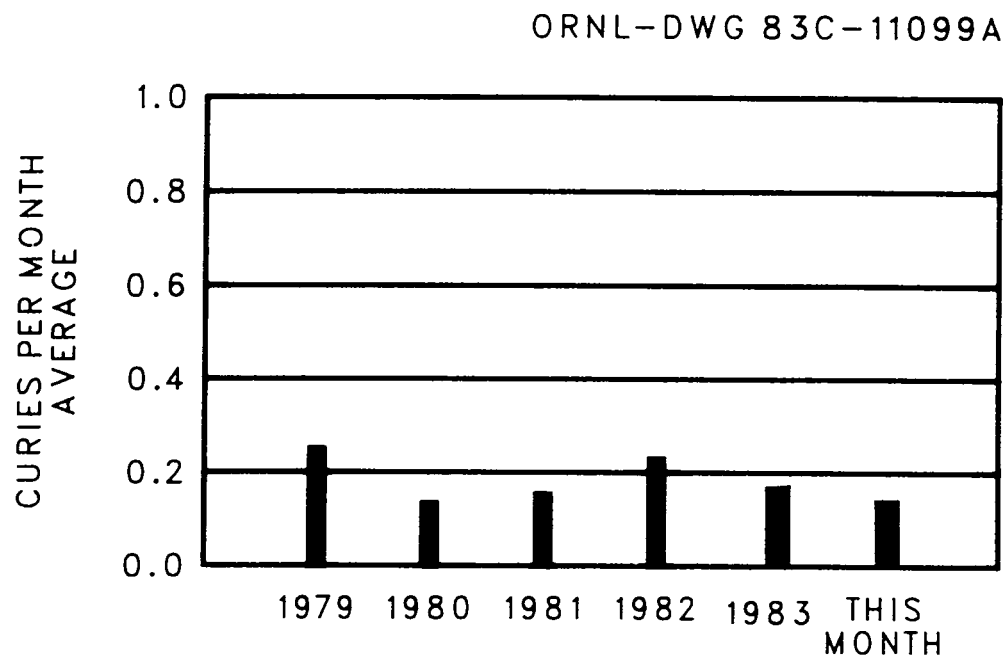


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3)

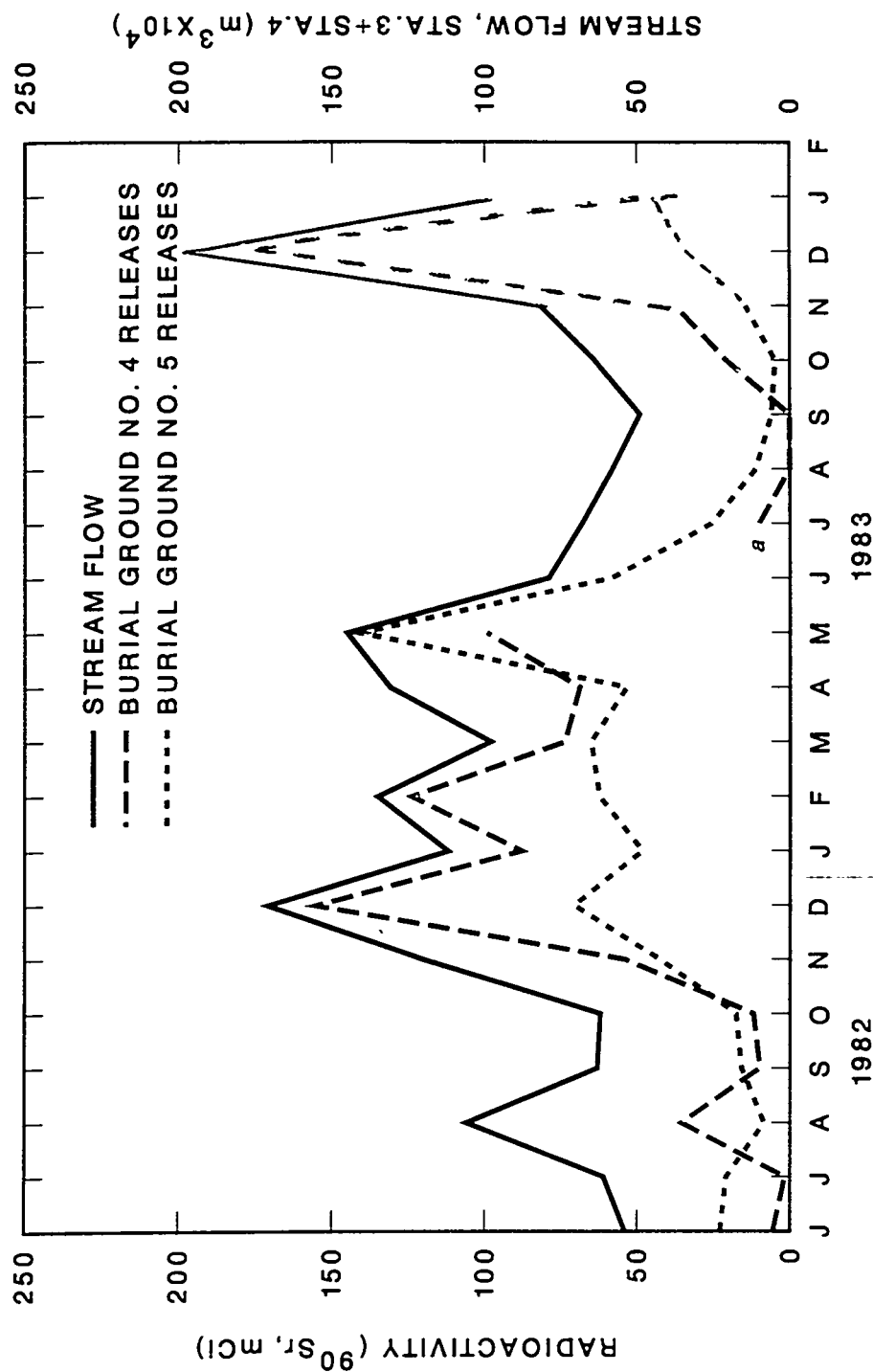


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

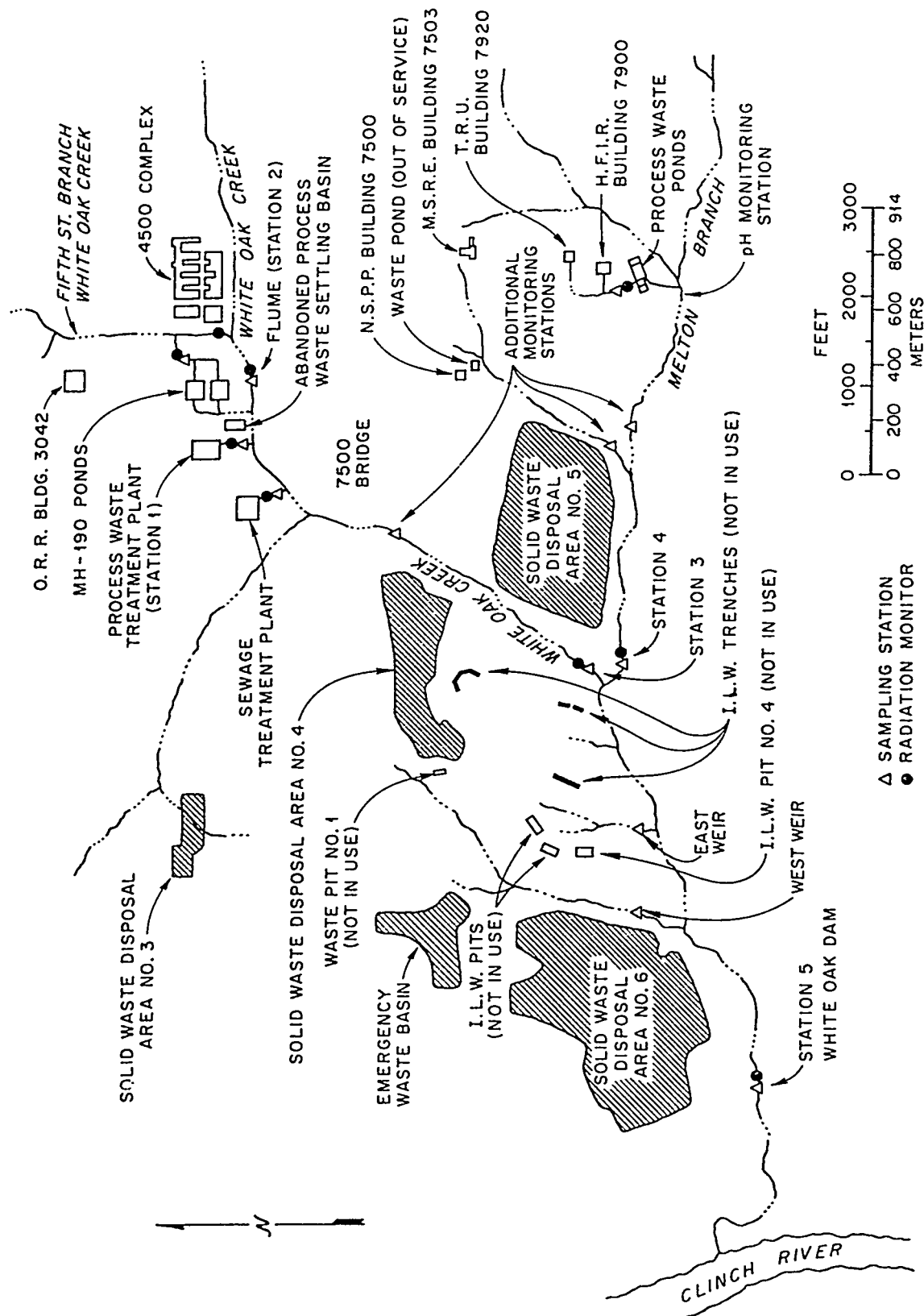


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100A

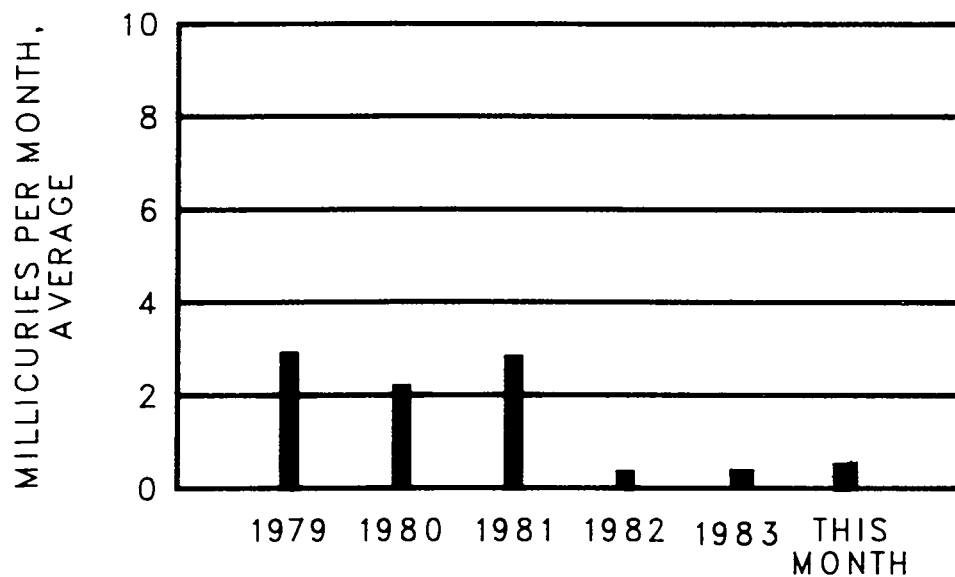


Fig. 4. ^{90}Sr Discharges in Waste to White Oak Creek.

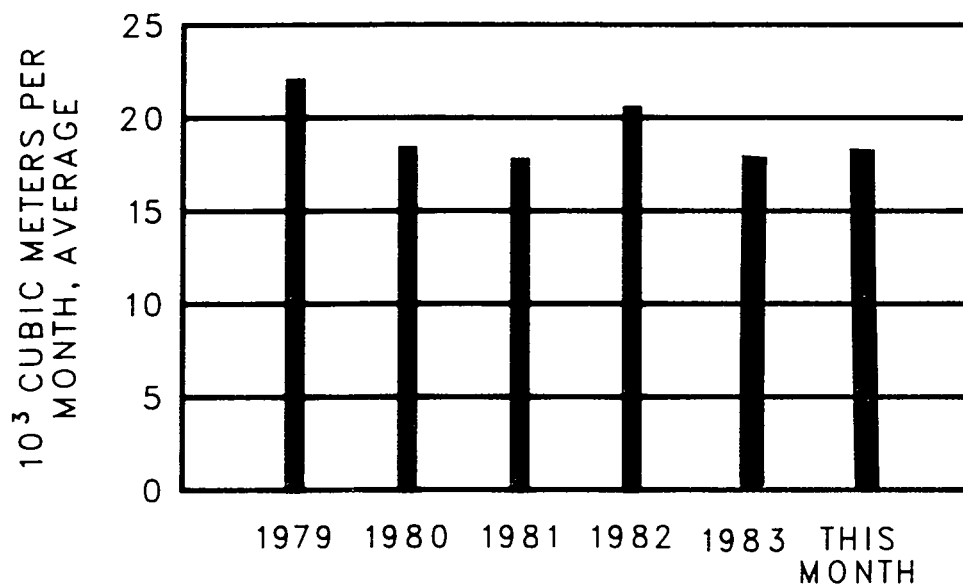


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101A

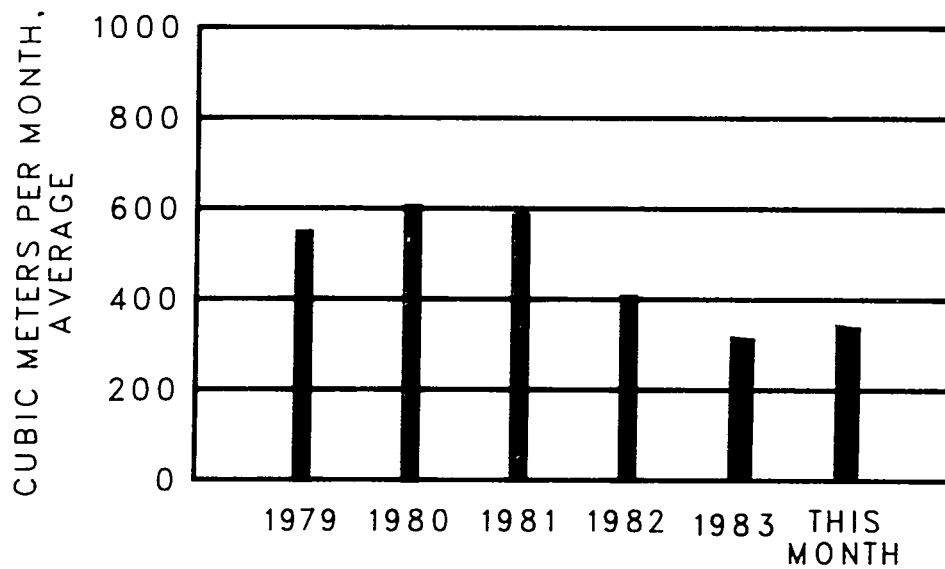


Fig. 6. Low-Level Waste Volume Generated this Month.

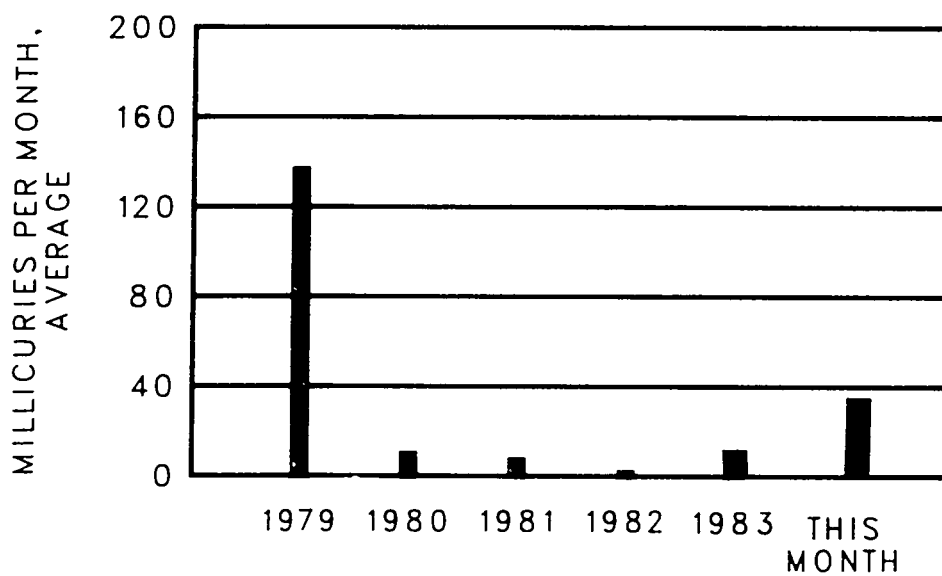


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr (Ci)	Gross Beta (Ci) ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.1032	0.2777
Discharge from Melton Valley Operations and Burial Ground 5	4	0.0517	0.0982
Discharge from LLW Pits and Trenches	East Weir	<0.0001	0.0006
Discharge from LLW Pits and Burial Ground 6	West Weir	0.0036	0.0146
Total discharge from all sources		0.1585	0.3965
White Oak Dam to Clinch River (EOS Measurements)		0.169	0.367

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	1,500	0.065	4.9	1.60	6.7
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.203 ^a	15.2	1.08	4.5
Reactor Operations (MH 112)	28	0.003	0.2	3.99	16.6
Buildings 3503 and 3508 (MH 229)	0.6	<0.001	---	3.59	14.9
Buildings 3025 and 3026 (MH 149)	10	<0.001	---	2.07	8.6
Building 3019 (MH 25)	6.2	<0.001	---	2.09	8.7
Waste Evaporator, Bldg. 2531 (MH 243)	10,000	0.595	44.4	2.20	9.1
Building 3525 (MH 235)	1.9	<0.001	---	0.96	4.0
Building 2026 (MH 240)	4.6	<0.001	---	1.01	4.2
Tank Farm Drainage	3,200	0.473	35.3	5.97	22.7

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	<0.01	<1
Central Radioactive Gas Disposal Facilities	3039	<0.037	14
Radiochemical-Processing Pilot Plant	3020	<0.01	<1
MSRE	7512	<0.01	<1
HFIR and TRU	7911	<0.01	<1
Activity in Gases Released at X-10 Site		<0.037	14
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		2 (³ H)	
Building 4508 Ventilation Discharges			3.1x10 ⁻⁴
Room 136			No sample
Room 265			
Building 5505 Discharges			No sample
Glove Box			7.8x10 ⁻³
Hood			

^aActivity primarily mixed fission products. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNot available.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-84/316

DATE: July 5, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF FEBRUARY 1984

TO: Distribution

FROM: L. C. Lasher ²⁷

Sponsor: J. H. Swanks ²⁷

This document has been approved for release
to the public by:

David R. Hamm 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

Operation of the Waste Monitoring and Collection Systems for the month of February was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 150 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 83% of this total. The Environmental and Occupational Safety Division measured a 141 mCi release of ^{90}Sr at the White Oak Dam sample station (0.3% MPC_w in the Clinch River for recorded flows). The measured release of radioactivity, primarily mixed fission products, from the ORNL stack systems was approximately 84 mCi (not including the noble gases).

One Unusual Occurrence Report was filed during this period: two chemical operators experienced low levels of contamination exposure when they removed a submersible pump from a waste collection tank.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of February was 0.3% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 37.8% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.141 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 77×10^4 and $20 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 146 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.8 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.2 mCi of ^{90}Sr was released from the 190 pond system, and a total of 10.3 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	8.7	
190 Ponds	0.2	
Process Waste Treatment Plant	0.8	
Sewage Treatment Plant	<u>10.3</u>	
	20.0	
7500 Sampling Station	53.0	
Burial Grounds 1 and 3 and Floodplains		33.0
Station 3	94.1	
Burial Ground 4		41.1

Melton Branch

7900 Area (HFIR and TRU)	0.3	
7500 Area (NSPP and MSRE)	<u>4.9</u>	
	5.2	
Station 4	51.6	
Burial Ground 5		46.4

LLW Pit Disposal Area

East Weir	0.1	
West Weir	<u>4.4</u>	
	4.5	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	150.2	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		125.0
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		83.2%

Process Waste

A total of $1.65 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.49 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 32 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	36	15	25.5
Volume treated (m^3)	790	310	520

Low-Level Waste

Both of the waste evaporator systems were operated during the reporting period. The average boil-down rate was $0.25 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	268.2
Volume transferred to evaporators	175.4
South Tank Farm Inventory:	
Beginning of Month	261.0
End of Month	261.0
Service Tank Inventory:	
W-21, Beginning of Month	25.2
W-21, End of Month	68.0
W-22, Beginning of Month	20.5
W-22, End of Month	32.9
W-23, Beginning of Month	51.9
W-23, End of Month	65.9
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	226.0
Total Volume at End of Month	238.0

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of LLW generated each month.

	<u>m³</u>
Transuranium Processing Area	7.6
Building 3019	17.0
Building 3525	11.0
Radioisotopes Processing Area	19.9
ORR and BSR	47.1
High Flux Isotope Reactor	21.3
Fission Products Development Laboratory	37.8 ^a
4500 Complex	6.6
Building 3544	52.1

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged ~84 mCi of gaseous radioactivity this month. The total amount of active particulates released during the period was 25 μ Ci. Inert gases released from the 3039 and 7911 Stacks averaged less than 3.94% and 0.73%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

Unusual Occurrence

Unusual Occurrence Report ORNL-84-12-OP-84-3, "Personnel Exposure and Contamination."

Two chemical operators experienced exposure and contamination of their hands and shoes during the removal of a pump from a LLW collection tank. The manhole cover of the tank was also slightly contaminated. The cover was subsequently cleaned. Dosimeter readings indicated that the operators had received whole body doses of 80 and 90 mR. The whole body counting and urine analysis of both men indicated no internal deposition.

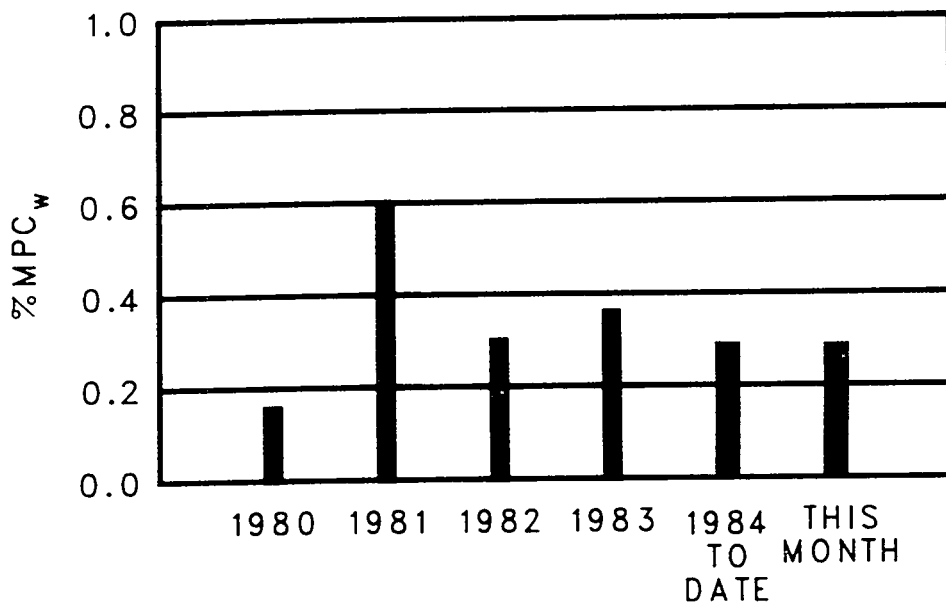


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (EOS Measurements at White Oak Dam).

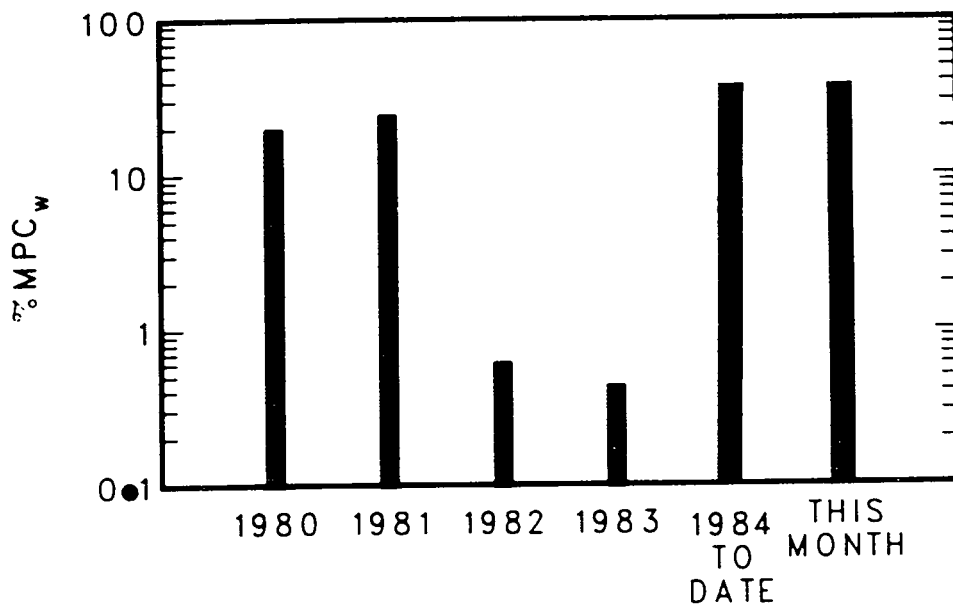


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (EOS Samples at Confluence of White Oak Creek and the Clinch River).

*Assumes complete mixing of White Oak Creek with the Clinch River.

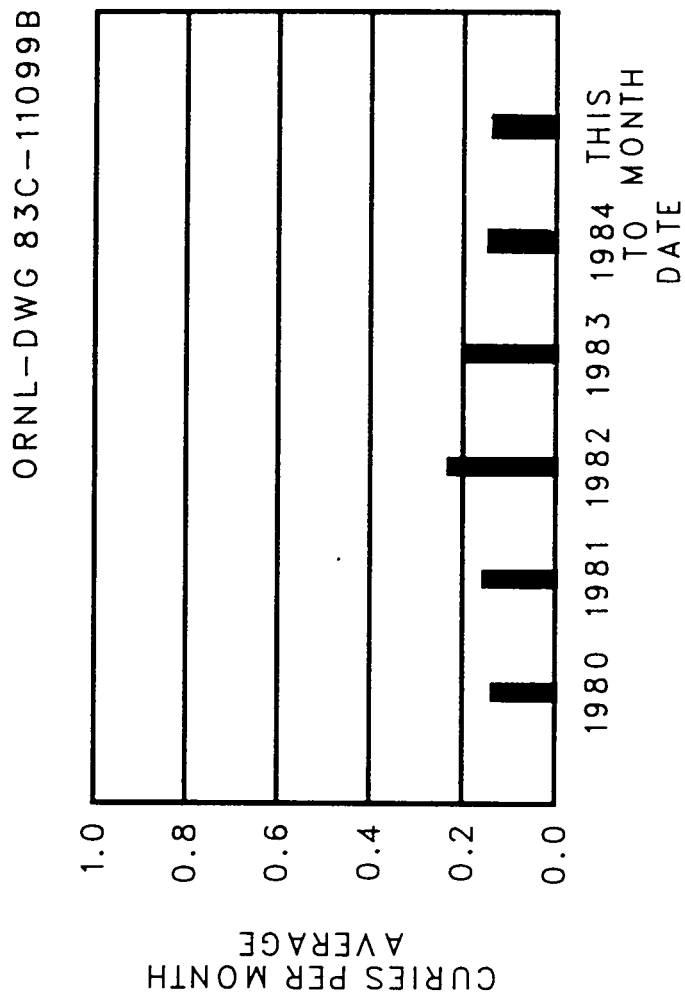


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3)

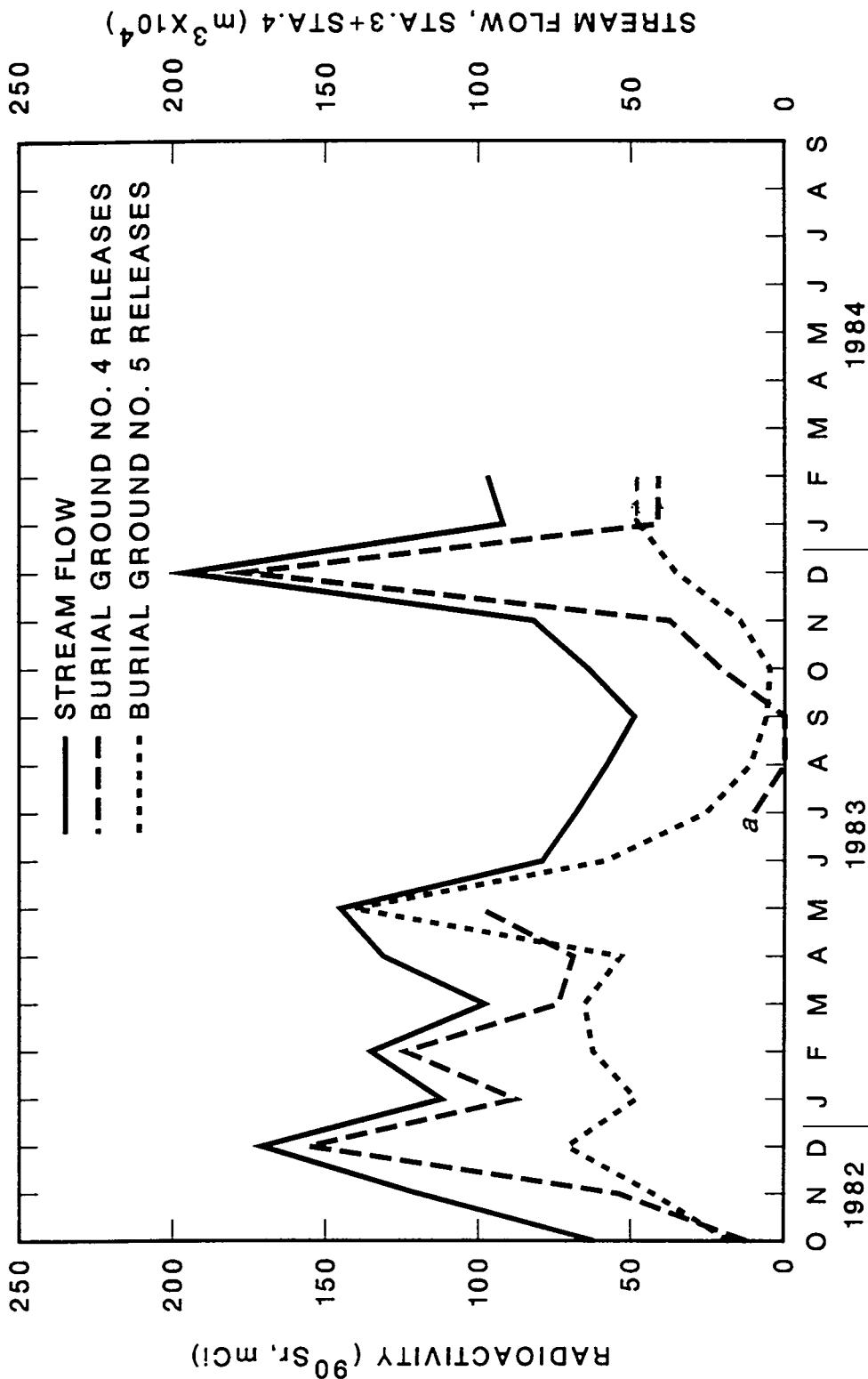


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

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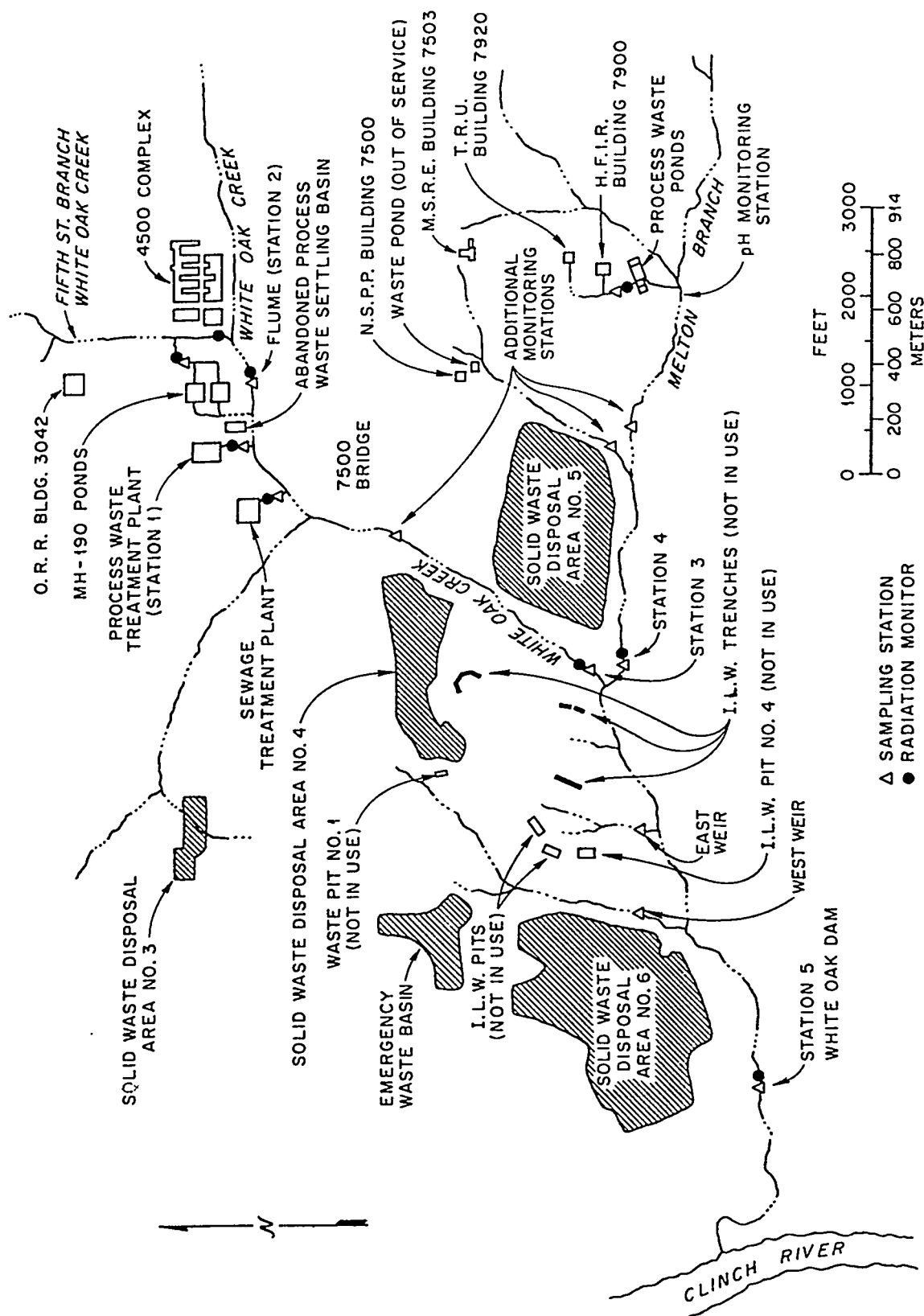


Fig.3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100B

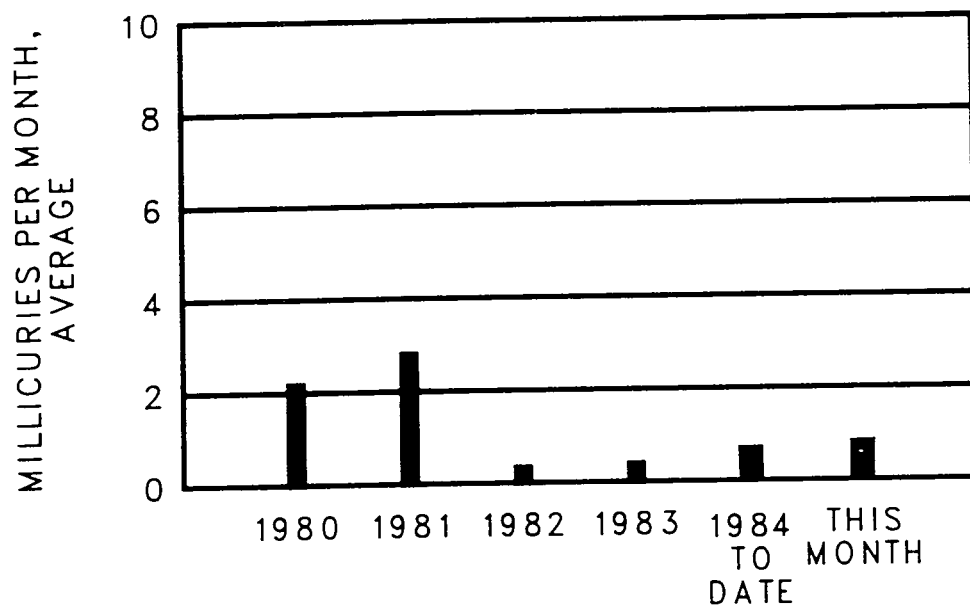


Fig. 4. ^{90}Sr Discharges in Waste to White Oak Creek.

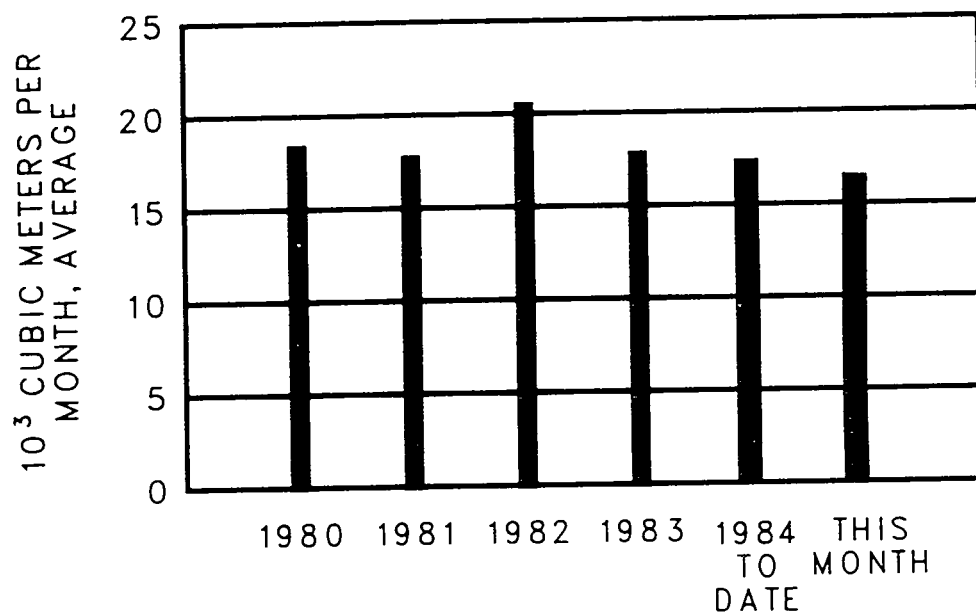


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101B

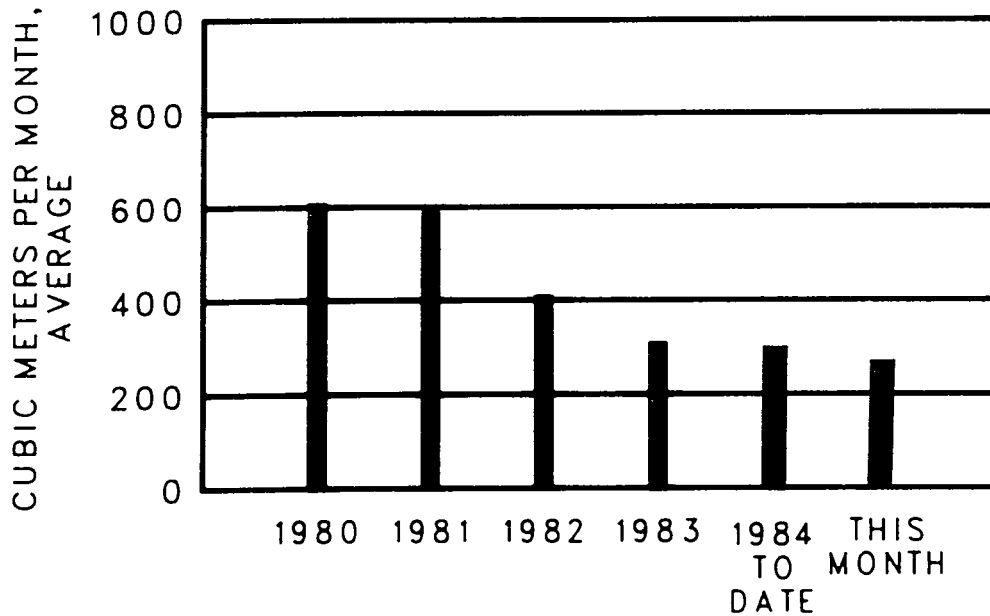


Fig. 6. Low-Level Waste Volume Generated this Month.

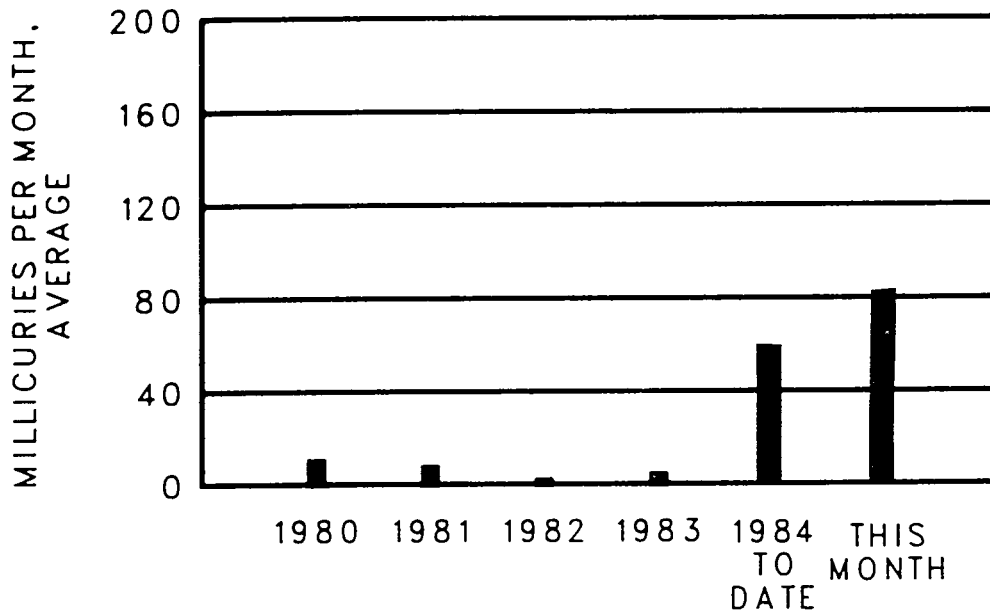


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr (Ci)	Gross Beta (Ci) ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.0941	0.1485
Discharge from Melton Valley Operations and Burial Ground 5	4	0.0516	0.1085
Discharge from LLW Pits and Trenches	East Weir	0.0001	-----
Discharge from LLW Pits and Burial Ground 6	West Weir	0.0044	-----
Total discharge from all sources		0.1501	0.2570
White Oak Dam to Clinch River (EOS Measurements)		0.141	0.322

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	90_{Sr} Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH234)	1,400	0.064	6.3	1.70	6.9
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.290 ^a	28.7	4.99	20.2
Reactor Operations (MH 112)	22	0.002	0.2	4.01	16.3
Buildings 3503 and 3508 (MH 229)	0.6	<0.001	---	2.42	9.8
Buildings 3025 and 3026 (MH 149)	11	<0.001	0.1	1.78	7.2
Building 3019 (MH 25)	6.3	<0.001	---	1.48	6.0
Waste Evaporator, Bldg. 2531 (MH 243)	5,600	0.235	23.2	1.55	6.3
Building 3525 (MH 235)	1.7	<0.001	---	0.76	3.0
Building 2026 (MH 240)	17.0	<0.001	0.1	0.98	4.0
Tank Farm Drainage	3,100	0.419	41.4	5.0	20.3

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (Ci)	Filterable Particulate Activity ^b (Ci)
HRLAL	2026	<0.01	<1
Central Radioactive Gas Disposal Facilities	3039	<0.030	28
Radiochemical-Processing Pilot Plant	3020	<0.01	<4
MSKE	7512	<0.01	<1
HFR and TRU	7911	<0.054	<5
Activity in Gases Released at X-10 Site		<0.084	37
Chem. Tech. Division - Y-12 Area			(c)
Building 4508 Ventilation Discharges			$\leq 1.54 \times 10^{-4}$
Room 136			$\leq 3.50 \times 10^{-5}$
Room 265			
Building 5505 Discharges			$\leq 2.25 \times 10^{-4}$
Glove Box			$\leq 3.87 \times 10^{-3}$

^aActivity primarily mixed fission products. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNot available.

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DATE: August 9, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF MARCH 1984

TO: Distribution

FROM: L. C. Lasher

Sponsor: J. H. Swanks ²⁷

This document has been approved for release
to the public by:

David R. Hamlin 7/15/96
Technical Information Officer Date
ORNL Site

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public release, it must be reviewed in accordance with
UCC-ND release procedures (SPP D-8-5).

SUMMARY

A total of 221 mCi of ^{90}Sr was discharged to White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated flood-plains, and the dormant pit disposal area accounted for 88% of this total. The Environmental and Occupational Safety Division measured a 208-mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as mixed fission products; the total release was less than 79 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of March was 0.3% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 41.9% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.208 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 10.8×10^5 and 23.9×10^4 m³, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 215 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were as follows: A total of 1.7 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.2 mCi of ^{90}Sr was released from the 190 pond system, and a total of 10.7 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	10.2	
190 Ponds	0.2	
Process Waste Treatment Plant	1.7	
Sewage Treatment Plant	<u>10.7</u>	
	22.8	
7500 Sampling Station	83.1	
Burial Grounds 1 and 3 and Floodplains		60.3
Station 3	151.8	
Burial Ground 4		68.7

Melton Branch

7900 Area (HFIR and TRU)	<0.4	
7500 Area (NSPP and MSRE)	<u>3.8</u>	
	4.2	
Station 4	63.3	
Burial Ground 5		59.1

LLW Pit Disposal Area

East Weir	<0.01	
West Weir	<u>5.9</u>	
	5.9	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	221.0	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		194.0
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		87.8%

Process Waste

A total of $2.0 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.78 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 39 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	35.5	21	27.6
Volume treated (m^3)	790	440	568

Construction of the 5,000 gallon bulk HNO_3 acid handling system at the PWTP was completed, and it was placed in service during the period.

Low-Level Waste

Both of the evaporator systems were operated in parallel during the month. The average boil-down rate was $0.55 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	383.5
Volume transferred to evaporators	408.3
South Tank Farm Inventory:	
Beginning of Month	226.0
End of Month	226.0
Service Tank Inventory:	
W-21, Beginning of Month	68.0
W-21, End of Month	47.6
W-22, Beginning of Month	32.9
W-22, End of Month	31.8
W-23, Beginning of Month	65.95
W-23, End of Month	114.3
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	236.0
Total Volume at End of Month	236.0

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of LLW generated each month.

	<u>m³</u>
Transuranium Processing Area	6.7
Building 3019	35.0
Building 3525	9.2
Radioisotopes Processing Area	31.3
ORR and BSR	53.2
High Flux Isotope Reactor	29.7
Fission Products Development Laboratory	52.9 ^a
4500 Complex	41.5
Building 3544	100.6

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jettied from the pit during the month. The pit can only be jettied to LLW since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <79 mCi of gaseous radioactivity this month. The bulk of this activity was identified as mixed fission products (approximately 2 mCi of ¹³¹I were detected). The total amount of active particulates released during the period was 72 μ Ci. Inert gases released from the 3039 and 7911 Stacks averaged less than 0.4% and 0.3%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

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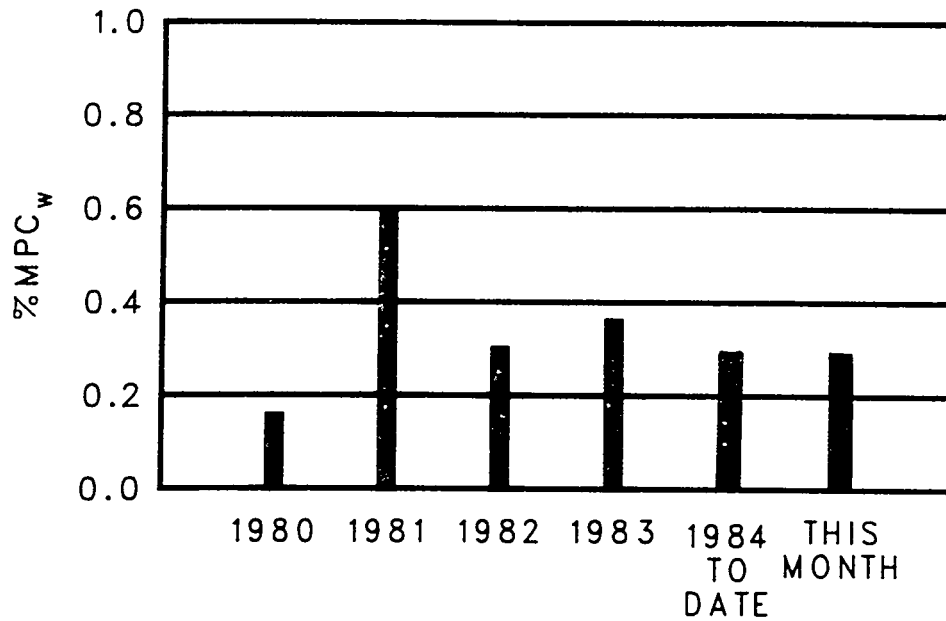


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (EOS Measurements at White Oak Dam).

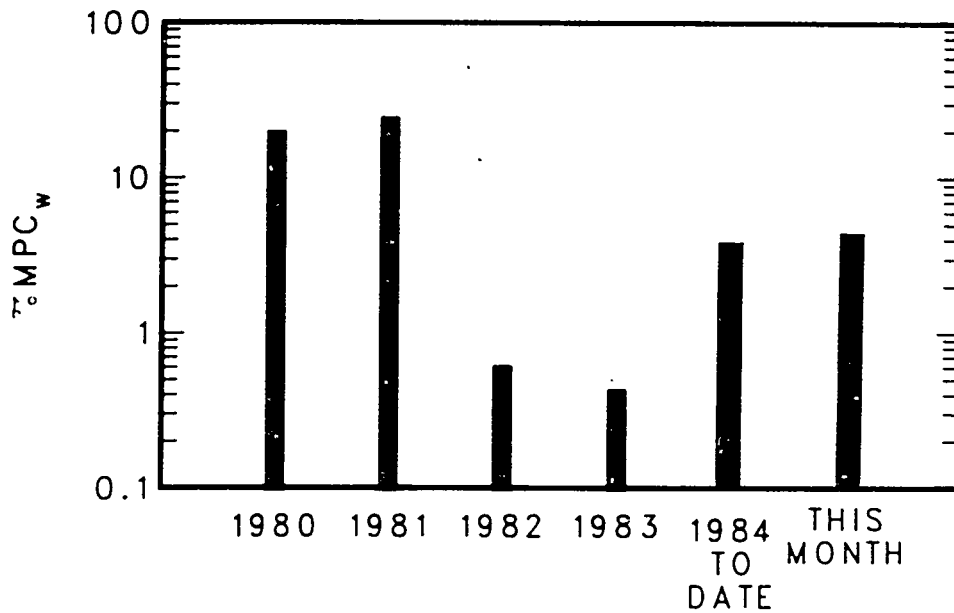


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (EOS Samples at Confluence of White Oak Creek and the Clinch River).

*Assumes complete mixing of White Oak Creek with the Clinch River.

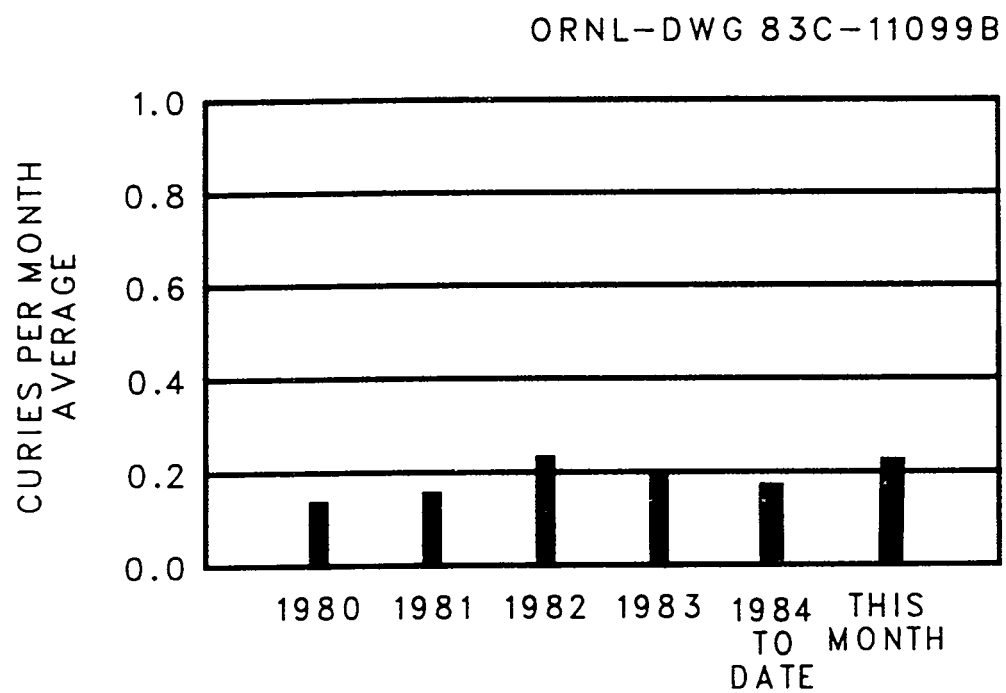


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3)

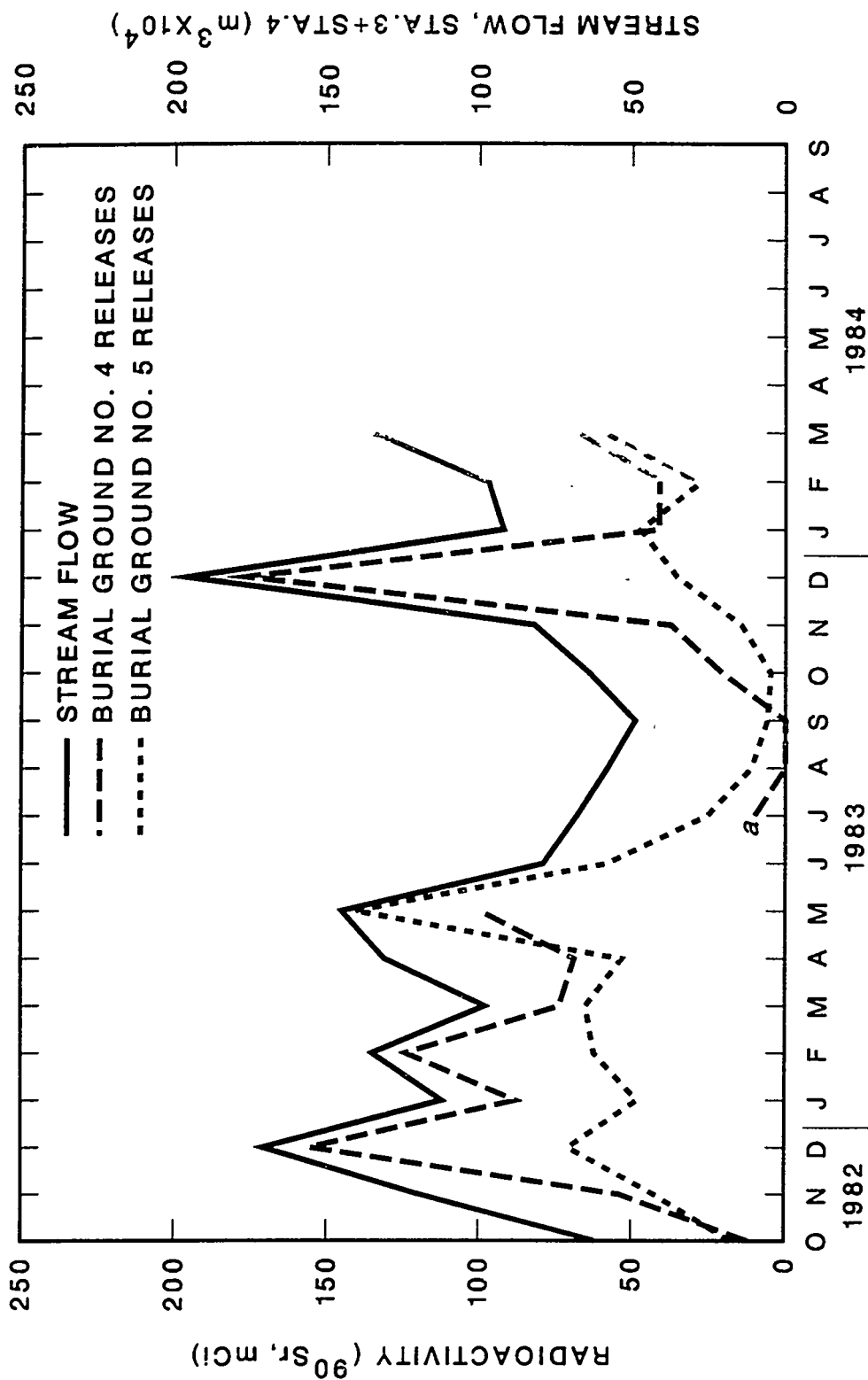


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

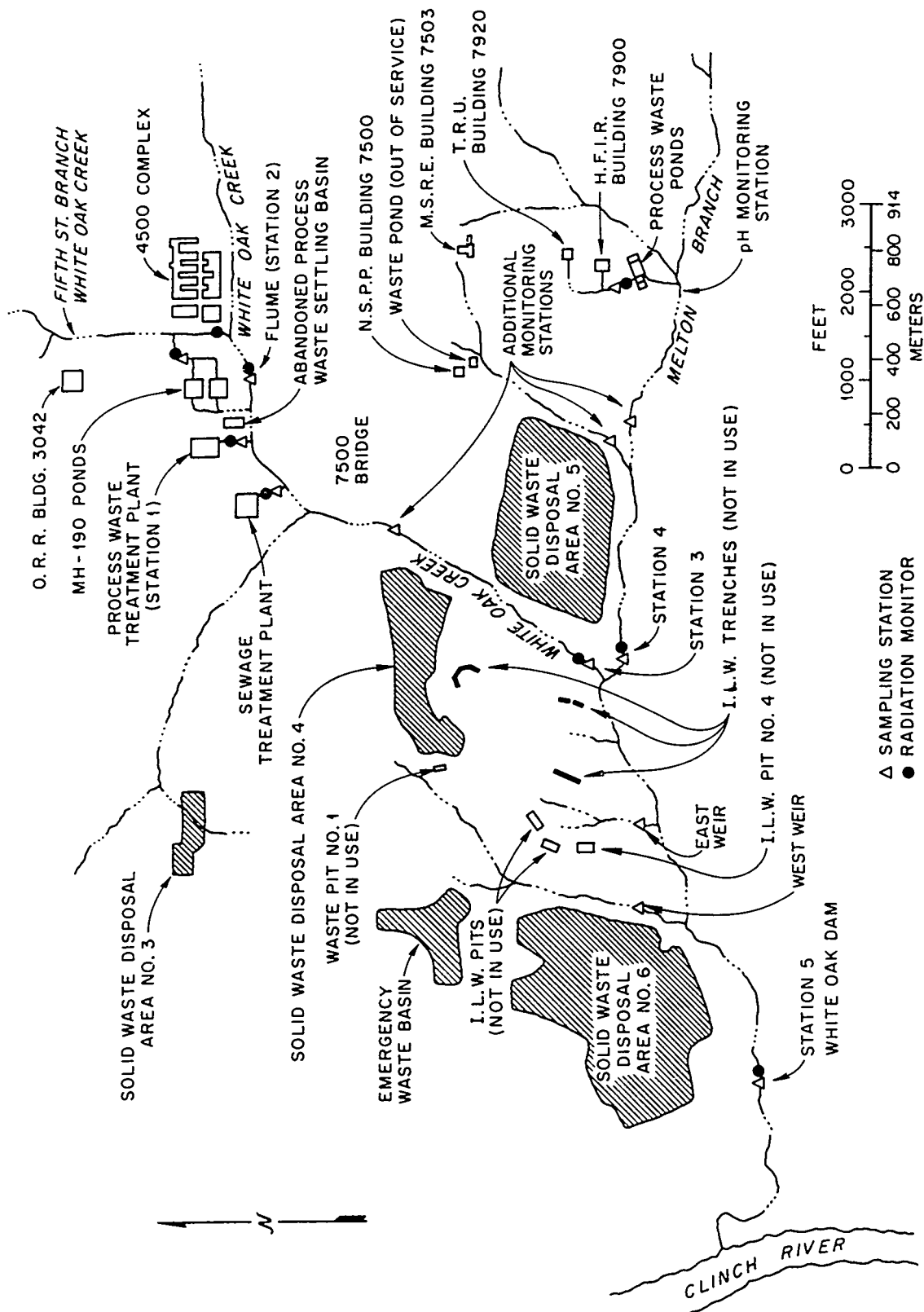


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-111008

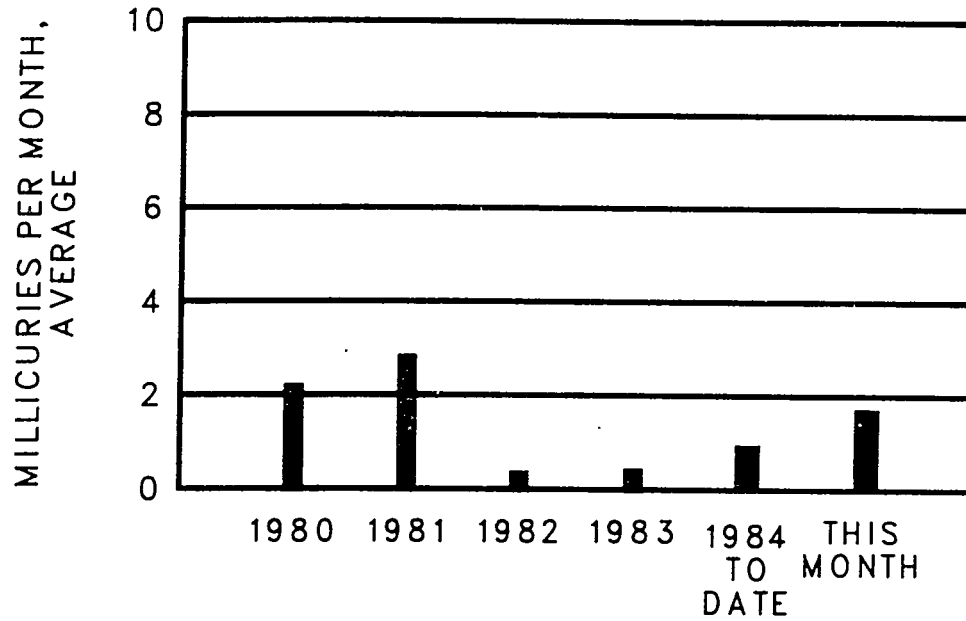


Fig. 4. ^{90}Sr Discharges in Waste to White Oak Creek.

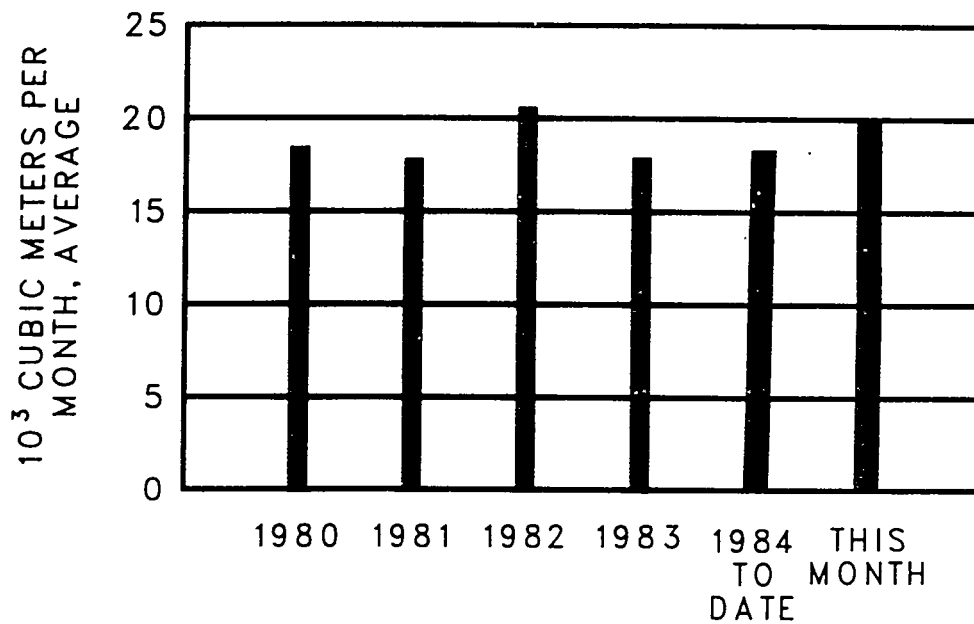


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101B

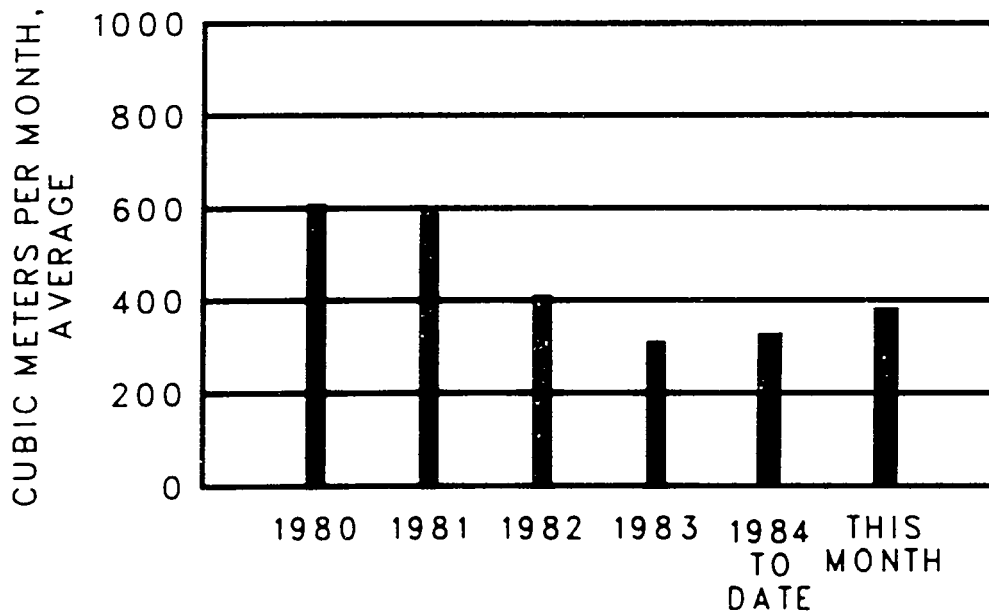


Fig. 6. Low-Level Waste Volume Generated this Month.

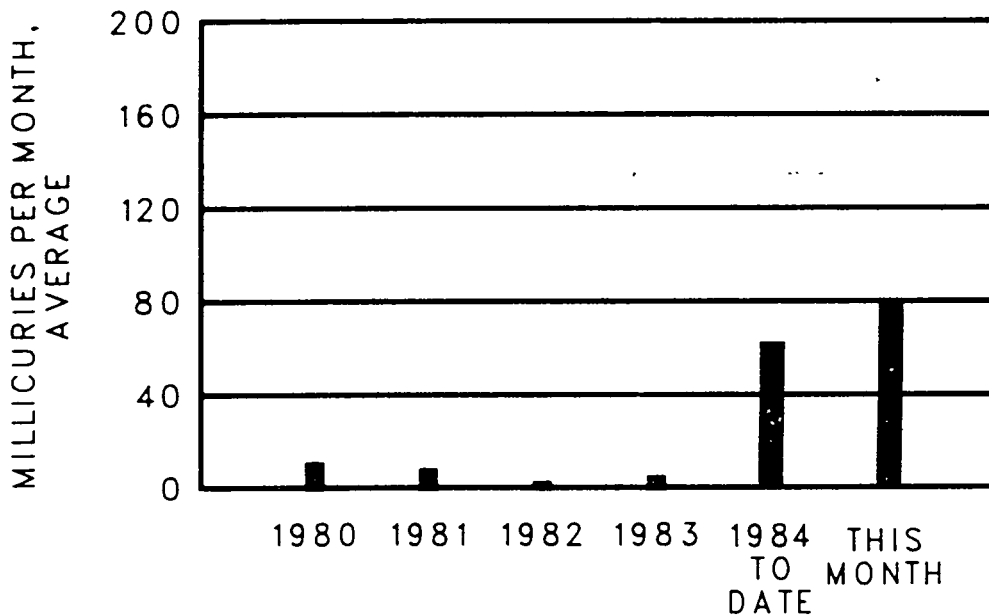


Fig. 7. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.0152	0.321
Discharge from Melton Valley Operations and Burial Ground 5	4	0.063	0.116
Discharge from LLW Pits and Trenches	East Weir	<0.0001	0.025
Discharge from LLW Pits and Burial Ground 6	West Weir	0.006	0.023
Total Discharge from All Sources		0.221	0.485
White Oak Dam to Clinch River (EOS Measurements)		0.208	0.40

^aRefers to Fig. 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	950	0.064	6.2	2.50	12.7
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.316 ^a	30.7	0.41	2.1
Reactor Operations (MH 112)	27	0.003	0.3	1.23	6.2
Buildings 3503 and 3508 (MH 229)	0.72	<0.001	---	1.82	9.2
Buildings 3025 and 3026 (MH 149)	49	<0.002	0.2	1.48	7.5
Building 3019 (MH 25)	8.5	<0.001	---	1.97	10.0
Waste Evaporator, Bldg. 2531 (MH 243)	1900	0.140	13.6	2.73	13.9
Building 3525 (MH 235)	0.4	<0.001	---	0.64	3.2
Building 2026 (MH 240)	1.5	<0.001	---	1.10	5.6
Tank Farm Drainage	3200	0.504	49.0	5.83	29.6

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a mCi	Filterable Particulate Activity ^b (μ Ci)
HRLAL	2026	<0.010	1
Central Radioactive Gas Disposal Facilities	3039	<29	66
Radiochemical-Processing Pilot Plant	3020	<0.001	1
MSRE	7512	<0.001	<1
HFIR and TRU	7911	<50	4
Activity in Gases Released at X-10 Site		<79	72
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building			----
Building 4508 Ventilation Discharges			NA
Room 136			
Room 265			3.5×10^{-5}
Building 5505 Discharges			
Glove Box			3.15×10^{-4}
Hood			5.42×10^{-3}

^aActivity determined by gamma analysis of charcoal filters. Approximately 2 mCi was ¹³¹I and most of remainder was radionuclides with a half life of 15 days or less.

Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-84/388

DATE: October 10, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF APRIL 1984

TO: Distribution

FROM: L. C. Lasher

Sponsor: J. H. Swanks²⁷

This document has been approved for release
to the public by:

David R. Hamm 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

A total of 175 mCi of ^{90}Sr was discharged to White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 86% of this total. The Environmental and Occupational Safety Division measured a 189-mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as mixed fission products; the total release was less than 141 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of April was 0.4% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 28.7% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.189 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were $87 \times 10^4 \text{ m}^3$ and $23 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 175 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were as follows: A total of 0.2 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.4 mCi of ^{90}Sr was released from the 190 pond system, and a total of 12.9 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	7.0	
190 Ponds	0.4	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	12.9	
	<u>20.5</u>	
7500 Sampling Station	65.6	
Burial Grounds 1 and 3 and Floodplains		45.1
Station 3	103.5	
Burial Ground 4		37.9

Melton Branch

7900 Area (HFIR and TRU)	0.4	
7500 Area (NSPP and MSRE)	4.3	
	<u>4.7</u>	
Station 4	68.6	
Burial Ground 5		63.9

LLW Pit Disposal Area

East Weir	<0.01	
West Weir	2.9	
	<u>2.9</u>	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	175.0	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		149.8
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		85.6%

Process Waste

A total of $1.91 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.80 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 36 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	32	23	27
Volume treated (m^3)	640	430	531

Low-Level Waste

Both of the evaporator systems were operated in parallel during the month. The average boil-down rate was $0.49 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total volume generated	381.1
Volume transferred to evaporators	349.6
South Tank Farm Inventory:	
Beginning of Month	226.0
End of Month	226.0
Service Tank Inventory:	
W-21, Beginning of Month	47.6
W-21, End of Month	64.9
W-22, Beginning of Month	31.8
W-22, End of Month	48.7
W-23, Beginning of Month	114.3
W-23, End of Month	57.1
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	236.0
Total Volume at End of Month	215.0

A list of major contributors of low-level waste is given below.

Figure 6 compares the volumes of LLW generated each month.

	$\frac{m^3}{m}$
Transuranium Processing Area	1.8
Building 3019	18.2
Building 3525	6.6
Radioisotopes Processing Area	46.1
ORR and BSR	80.4
High Flux Isotope Reactor	63.5
Fission Products Development Laboratory	24.9 ^a
4500 Complex	16.2
Building 3544	62.8

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW, since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <141 mCi of gaseous radioactivity this month. The bulk of this activity was identified as mixed fission products (approximately 3 mCi of ^{131}I were detected). The total amount of active particulates released during the period was 183 μCi . Inert gases released from the 3039 and 7911 Stacks averaged less than 0.4% and 0.3%, respectively, of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

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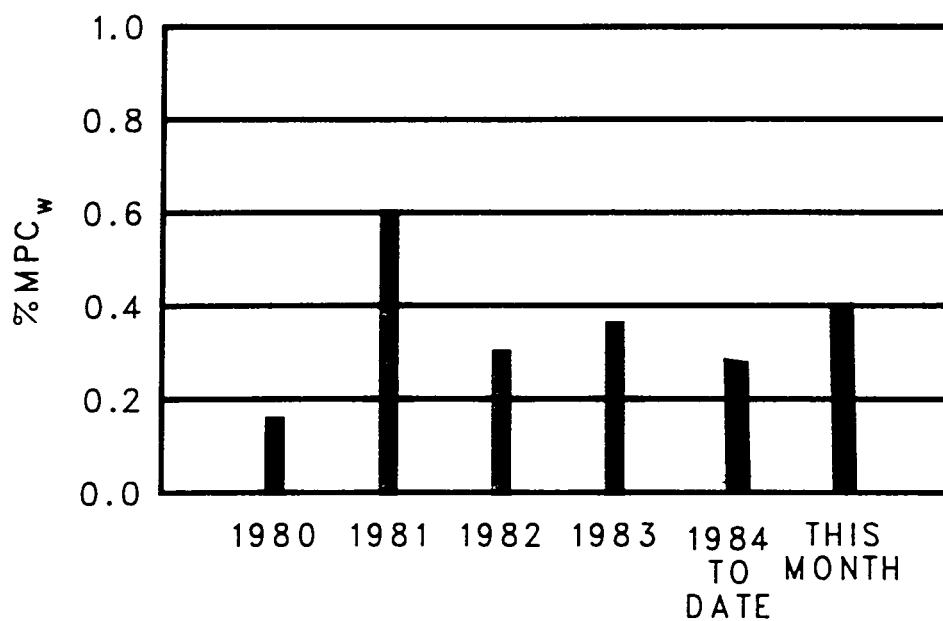


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (EOS Measurements at White Oak Dam).

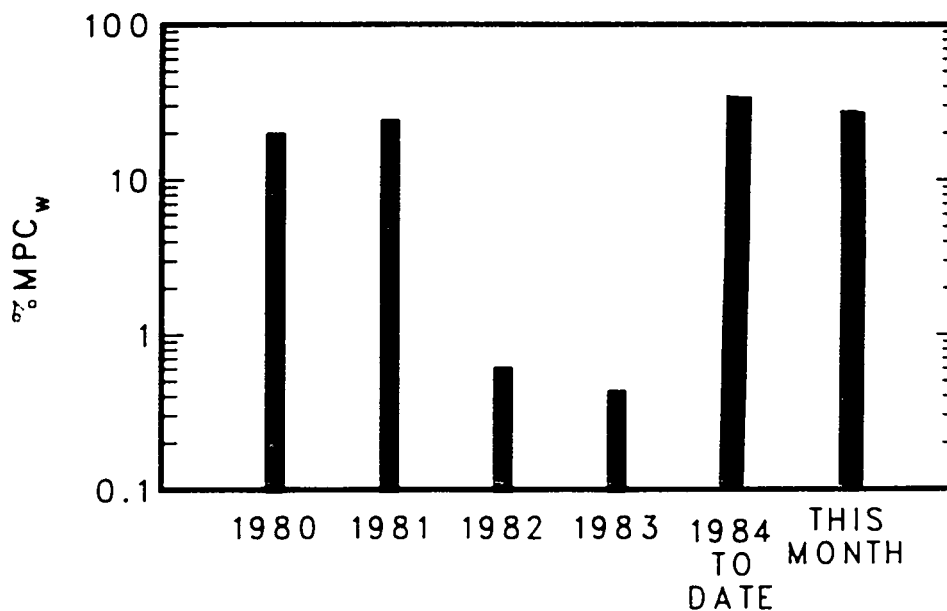


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (EOS Samples at Confluence of White Oak Creek and the Clinch River).

*Assumes complete mixing of White Oak Creek with the Clinch River.

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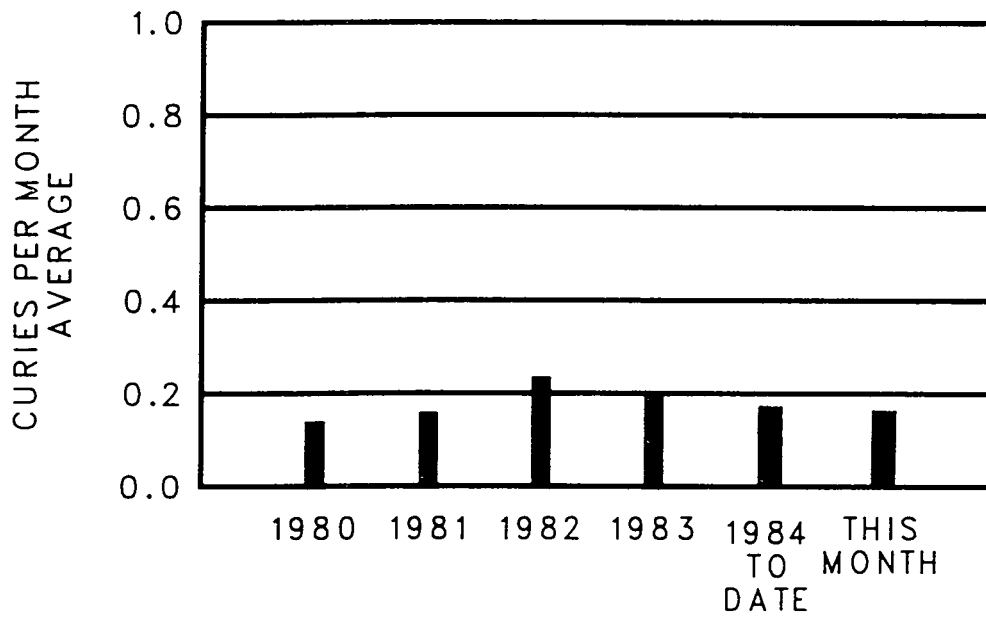


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3)

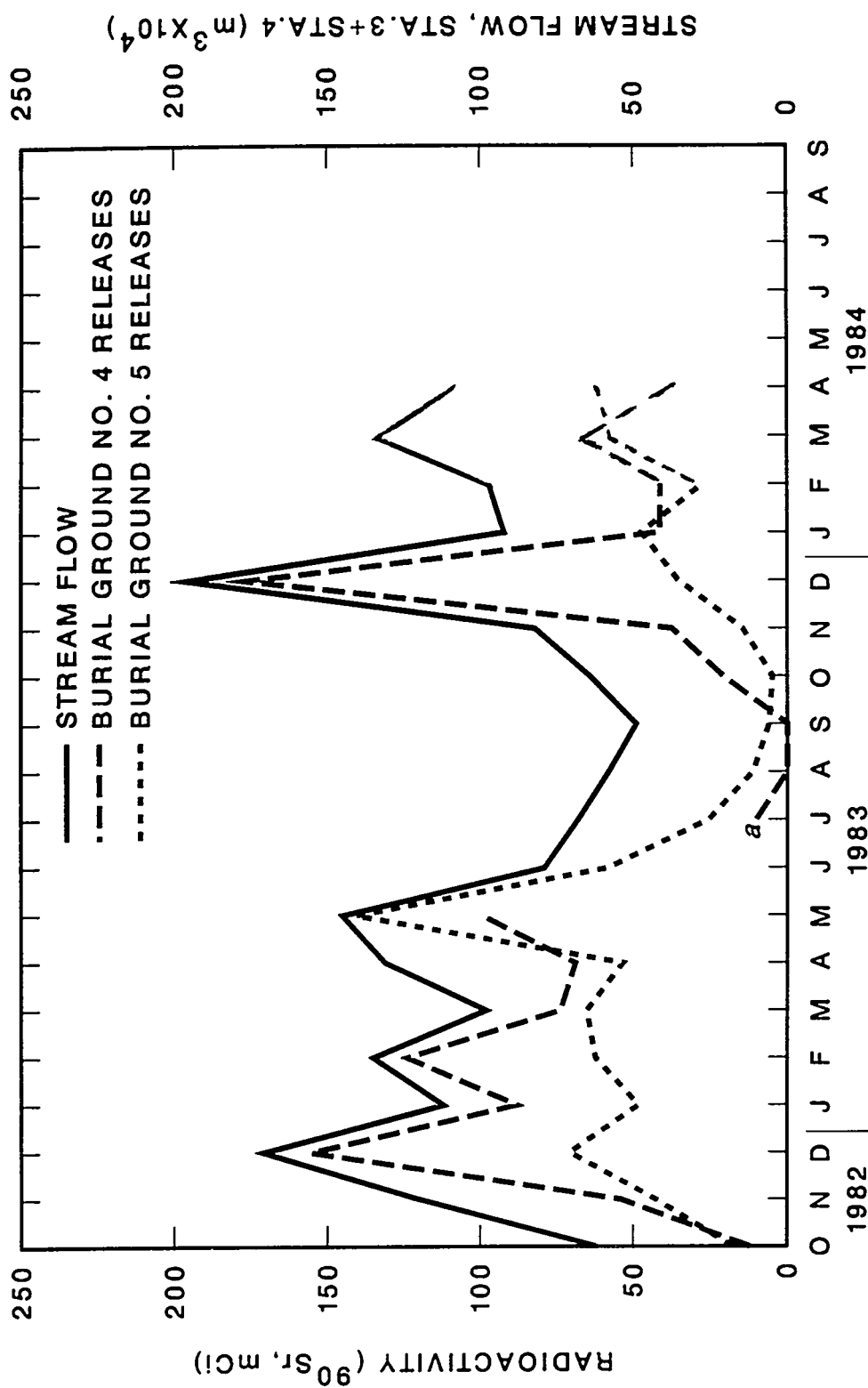


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

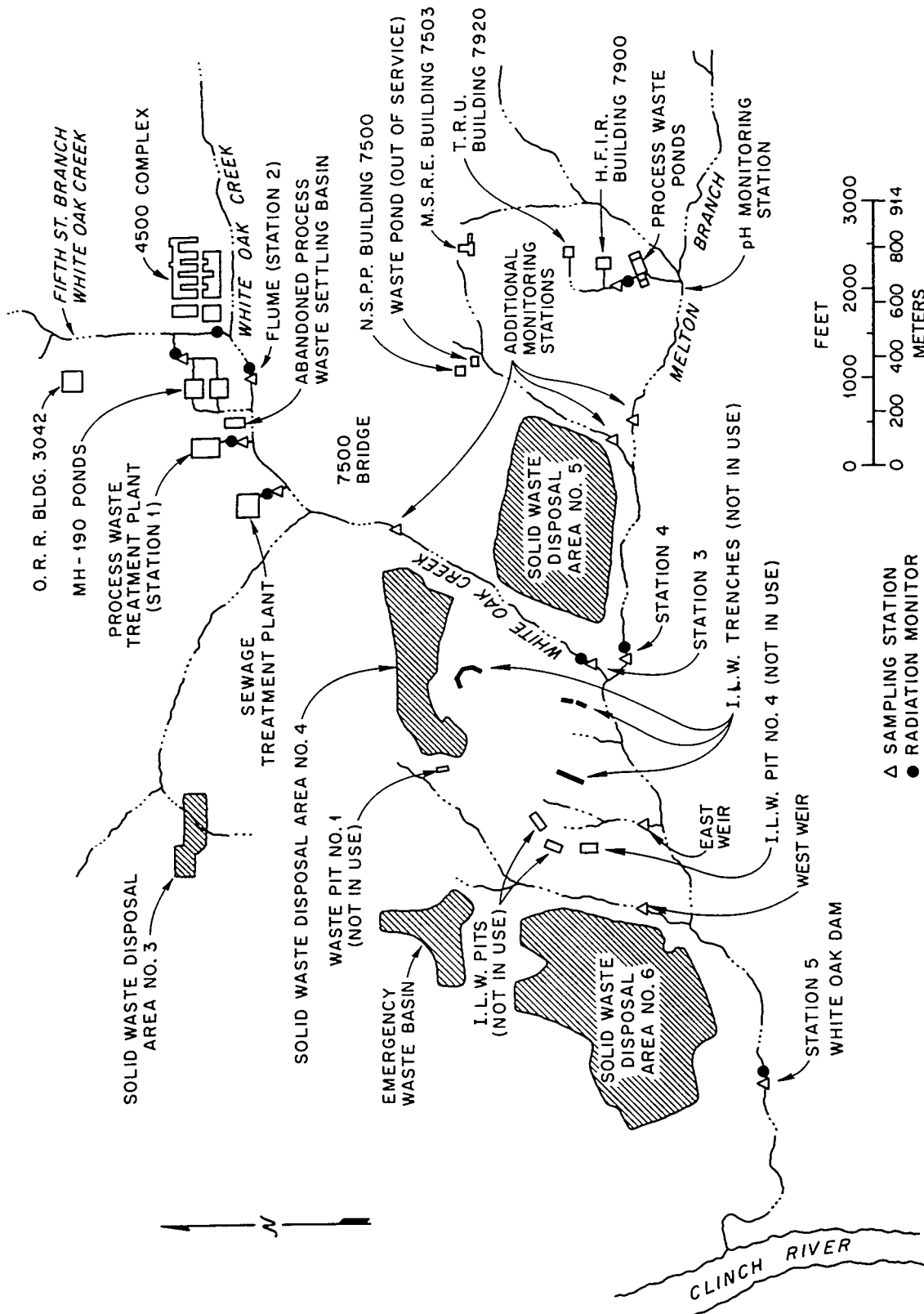


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100B

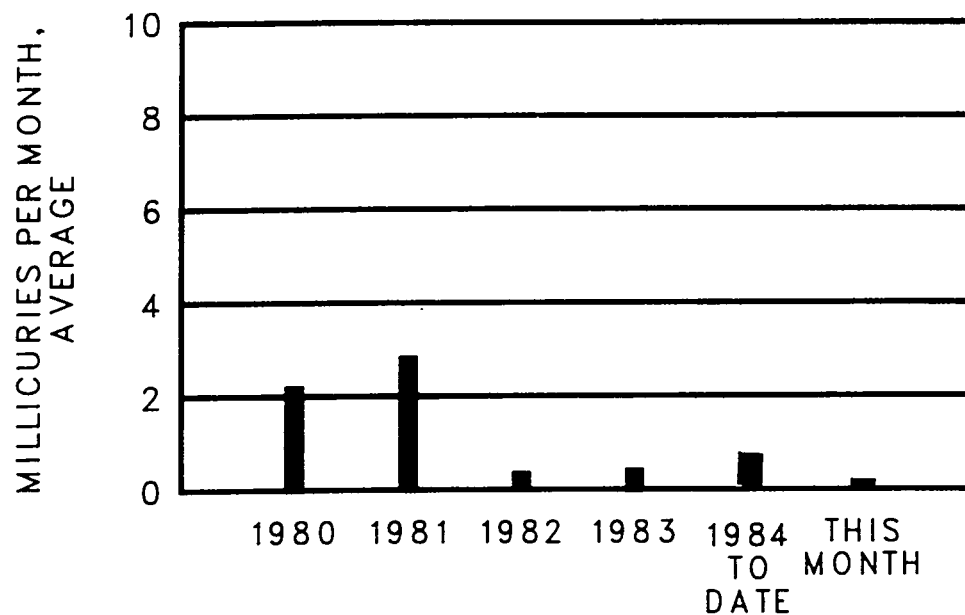


Fig. 4. ^{90}Sr Discharges From PWTP to White Oak Creek.

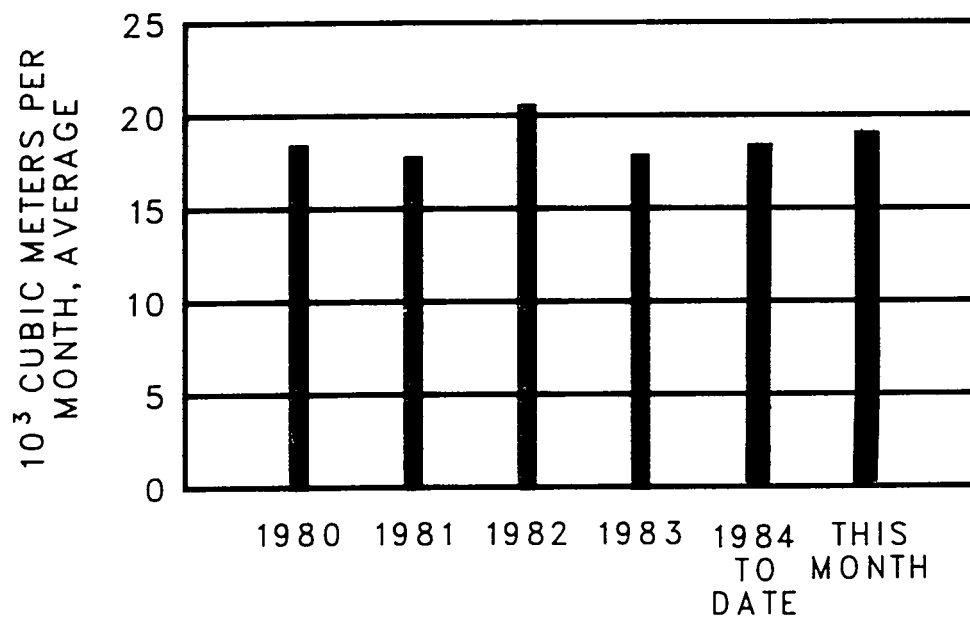


Fig. 5. Process Waste Volumes Treated in the PWTP.

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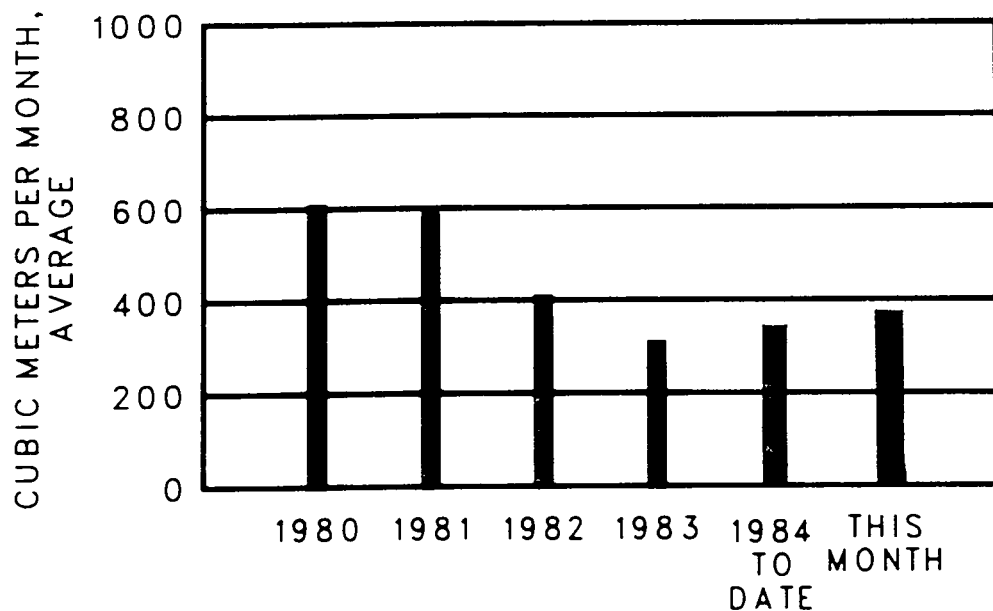


Fig. 6. Low-Level Waste Volume Generated this Month.

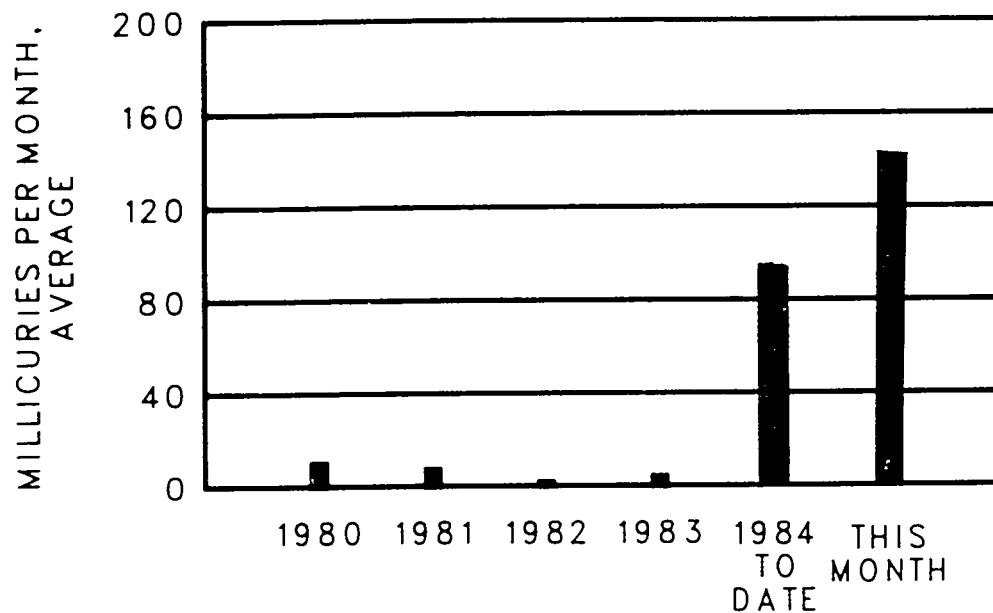


Fig. 7. Total Activity Released in Gaseous Waste (Mainly MFP; Does not Include Rare Gases or Other Nonadsorbable species). ORNL's Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.104	0.226
Discharge from Melton Valley Operations and Burial Ground 5	4	0.069	0.144
Discharge from LLW Pits and Trenches	East Weir	<0.001	-----
Discharge from LLW Pits and Burial Ground 6	West Weir	0.003	-----
Total Discharge from All Sources		0.175	0.370
White Oak Dam to Clinch River (EOS Measurements)		0.189	0.462

^aRefers to Fig. 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Cl	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	1200	0.246	25.4	7.57	22.8
Radioisotopes Processing Area (MH 114 minus MH 112)	----	0.193 ^a	19.9	1.63	4.9
Reactor Operations (MH 112)	25	0.003	0.3	4.96	14.9
Buildings 3503 and 3508 (MH 229)	0.72	<0.001	----	2.01	6.1
Buildings 3025 and 3026 (MH 149)	11	<0.001	----	1.14	3.4
Building 3019 (MH 25)	19	<0.001	0.1	2.16	6.5
Waste Evaporator, Bldg. 2531 (MH 243)	1400	0.099	10.2	2.61	7.9
Building 3525 (MH 235)	0.4	<0.001	----	4.54	13.7
Building 2026 (MH 240)	2.6	<0.001	----	1.32	4.0
Tank Farm Drainage	3000	0.427	44.1	5.26	15.8

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (mCi)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	<0.001	1
Central Radioactive Gas Disposal Facilities	3039	<89	173
Radiochemical-Processing Pilot Plant	3020	<0.02	4
MSRE	7512	<0.001	<0.1
HFIR and TRU	7911	<52	5
Activity in Gases Released at X-10 Site		<141	183
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		(c)	---
Building 4508 Ventilation Discharges Room 136 Room 265			No sample 2.2×10^{-4}
Building 5505 Discharges Glove Box Hood			1.5×10^{-3} 2.5×10^{-2}

^aActivity primarily ^{131}I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-84/418

DATE: November 14, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF MAY 1984

TO: Distribution

FROM: L. C. Lasher²⁷Sponsor: J. H. Swanks²⁷This document has been approved for release
to the public by:

Daniel Hammit 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

A total of 358 mCi of ^{90}Sr was discharged to White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 89% of this total. The Environmental and Occupational Safety Division measured a 360 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. Approximately 3.8 mCi of radioactivity identified as ^{131}I was emitted with the gaseous waste from the ORNL stacks.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of May was 0.2% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 6.3% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.360 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were $200 \times 10^4 \text{ m}^3$ and $33 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 358 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were as follows: A total of 0.2 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant, 0.9 mCi of ⁹⁰Sr was released from the 190 pond system, and a total of 22.6 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	5.4	
190 Ponds	0.9	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>22.6</u>	
	29.1	
7500 Sampling Station	182.0	
Burial Grounds 1 and 3 and Floodplains		152.9
Station 3	280.0	
Burial Ground 4		98.0

Melton Branch

7900 Area (HFIR and TRU)	0.8	
7500 Area (NSPP and MSRE)	<u>6.5</u>	
	7.3	
Station 4	67.4	
Burial Ground 5		60.1

Liquid LLW Pit Disposal Area

East Weir	0.2	
West Weir	<u>10.4</u>	
	10.6	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	358.0	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		321.6
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		89.8%

Process Waste

A total of $2.27 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $2.11 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 40 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	35.0	10.0	27.5
Volume treated (m^3)	533	133	443

Liquid Low-Level Waste

Both of the evaporator systems were operated in parallel during the month. The average boil-down rate was $0.69 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total Volume Generated	597.1
Volume Transferred to Evaporators	541.0
South Tank Farm Inventory:	
Beginning of Month	226.0
End of Month	226.0
Service Tank Inventory:	
W-21, Beginning of Month	64.9
W-21, End of Month	68.0
W-22, Beginning of Month	47.7
W-22, End of Month	19.5
W-23, Beginning of Month	57.1
W-23, End of Month	98.5
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	215.0
Total Volume at End of Month	351.8

A list of major contributors of liquid low-level waste is given below.

Figure 6 compares the volumes of liquid LLW generated each month.

	<u>$\frac{3}{m}$</u>
Transuranium Processing Area	0.0
Building 3019	87.3
Building 3525	23.7
Radioisotopes Processing Area	24.9
ORR and BSK	61.4
High Flux Isotope Reactor	69.0
Fission Products Development Laboratory	64.4 ^a
4500 Complex	67.0
Building 3544	105.8

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to the liquid LLW line, since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged <3.8 mCi of gaseous radioactive ^{131}I this month. Miscellaneous short-lived nonfilterable radioactive nuclides (an insignificant hazard relative to ^{131}I , ^3H , and noble gas releases) were also detected. The total amount of active particulates released during the period was 345 μCi . Inert gases released from the 3039 and 7911 Stacks averaged less than 1.5% and 0.8%, respectively, of the calculated maximum permissible operating levels for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

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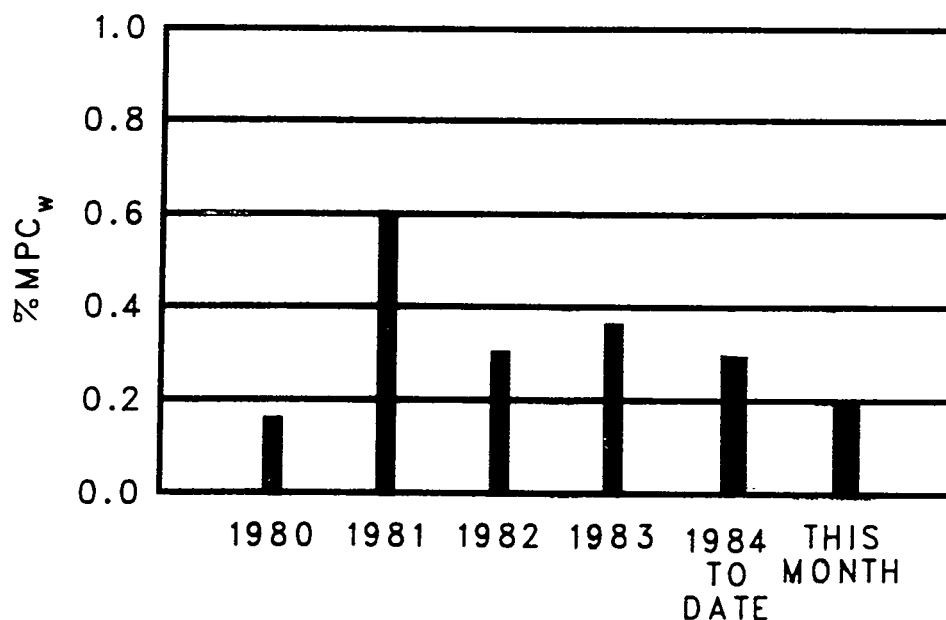


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (EOS Measurements at White Oak Dam).

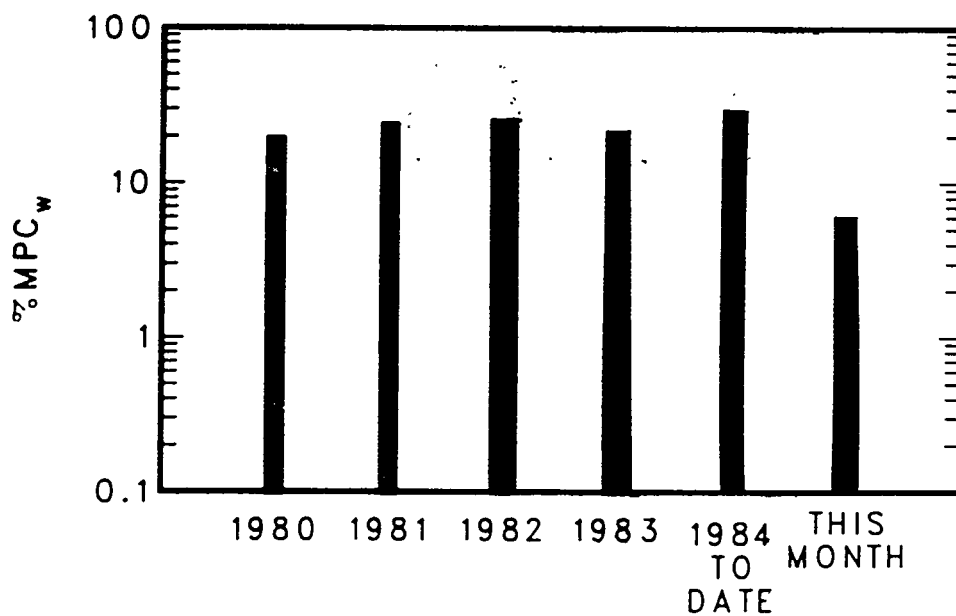


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (EOS Samples at Confluence of White Oak Creek and the Clinch River).

*Assumes complete mixing of White Oak Creek with the Clinch River.

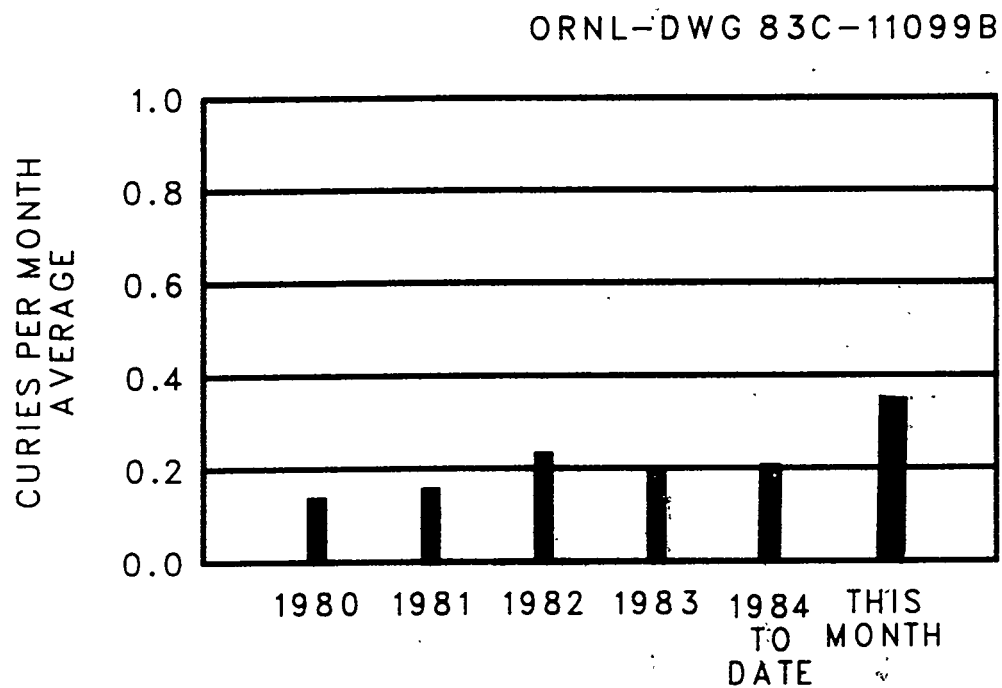


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3)

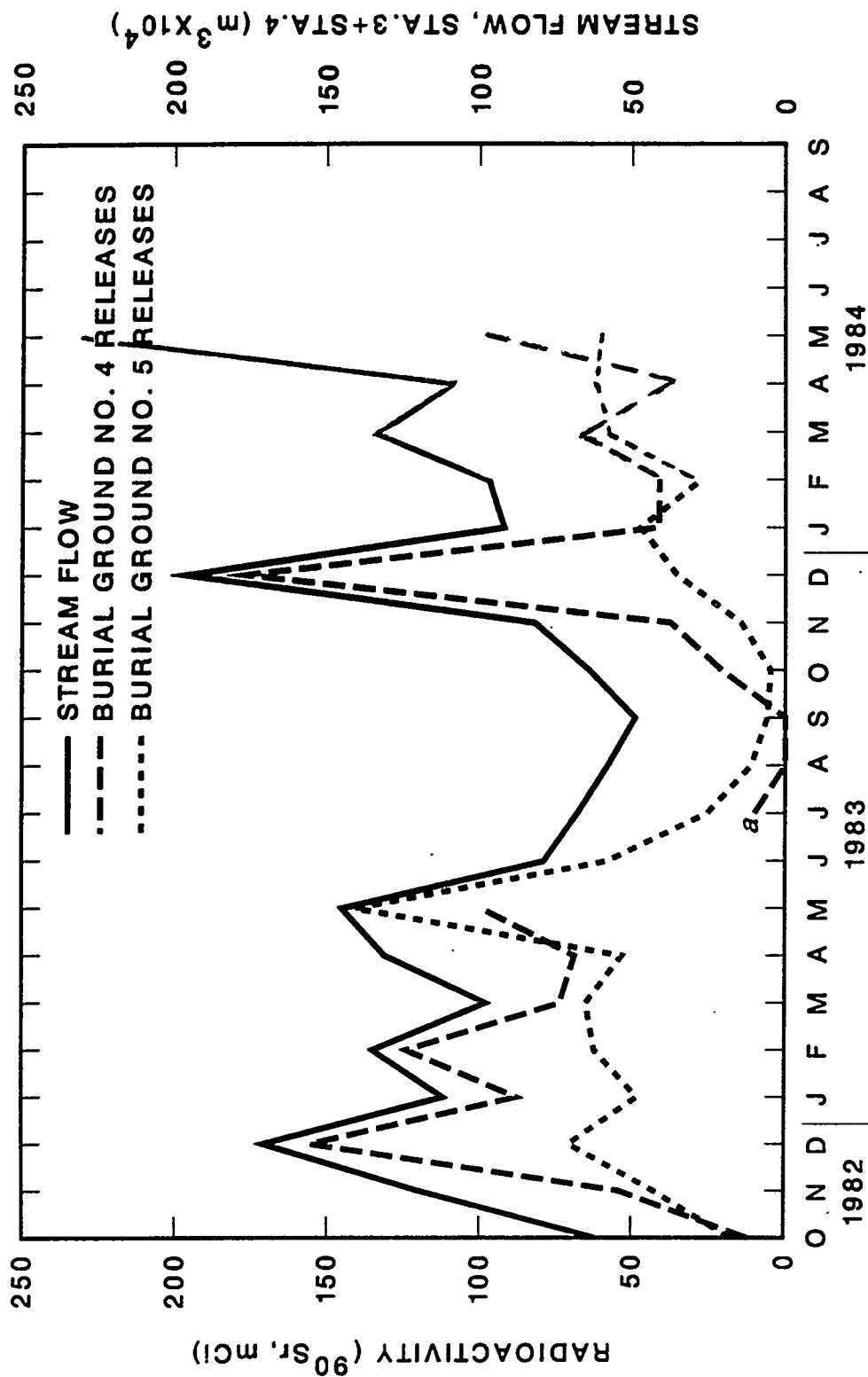


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

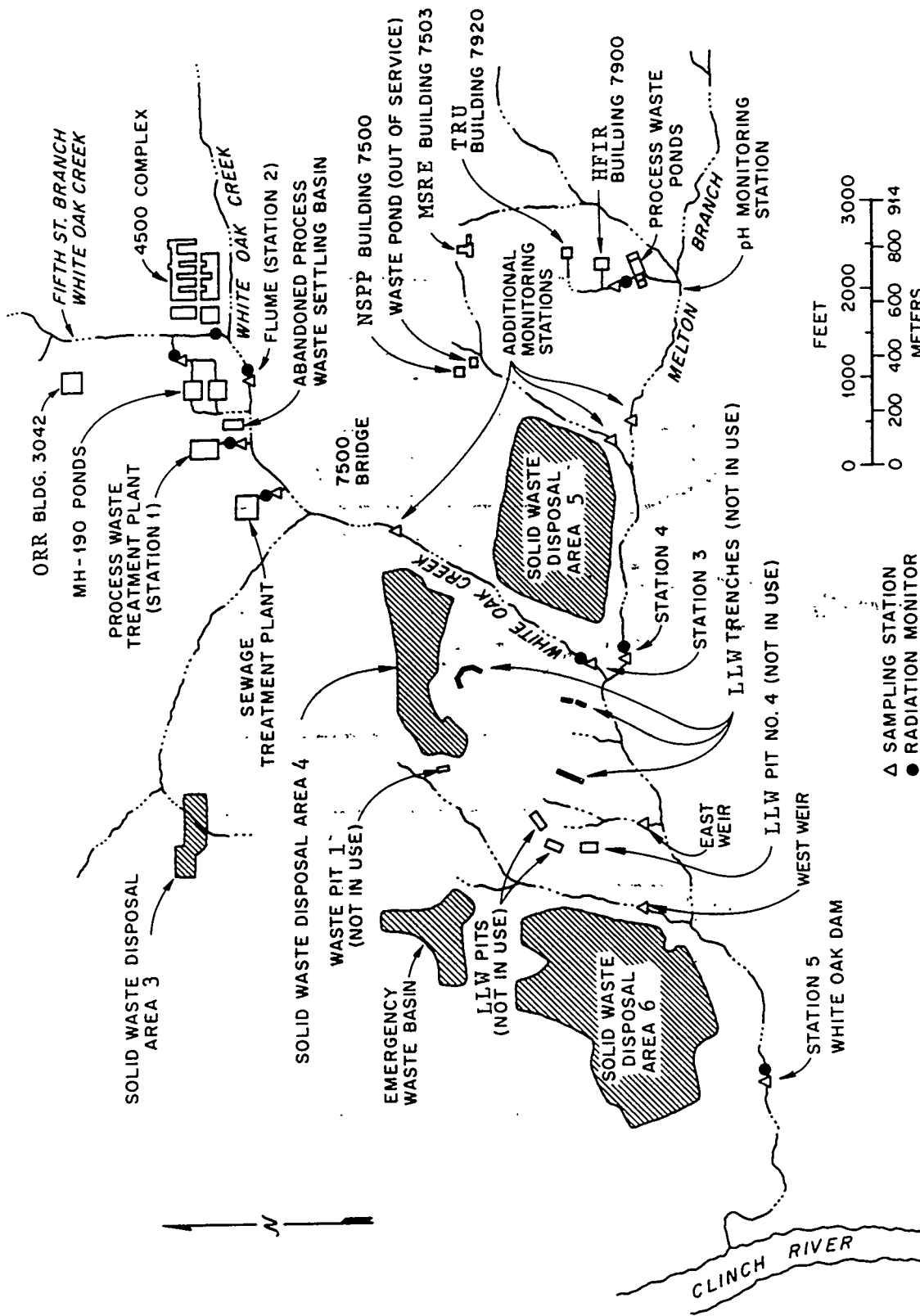


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100B

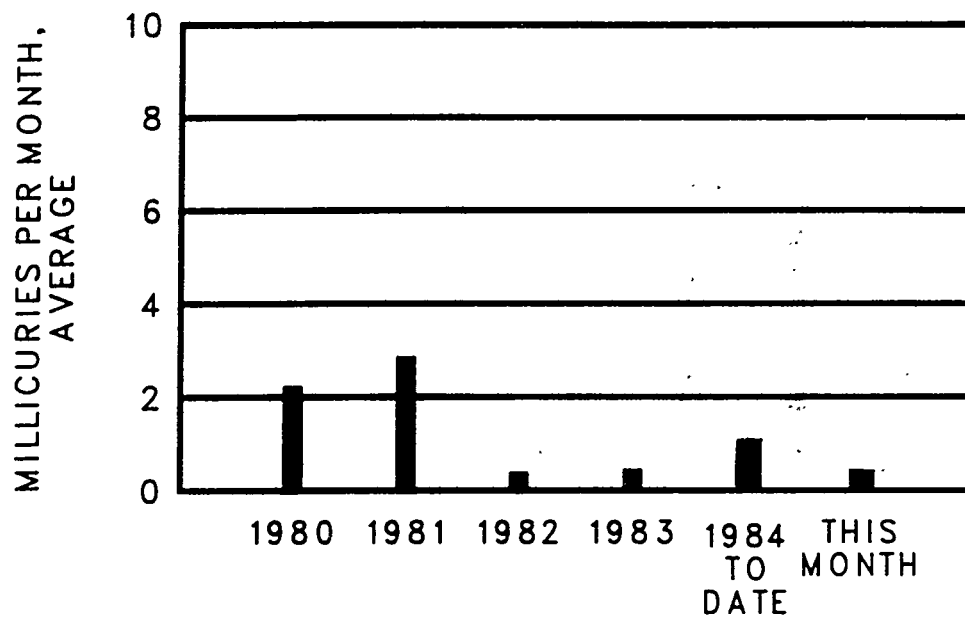


Fig. 4. ^{90}Sr Discharges in Waste from PWT to White Oak Creek.

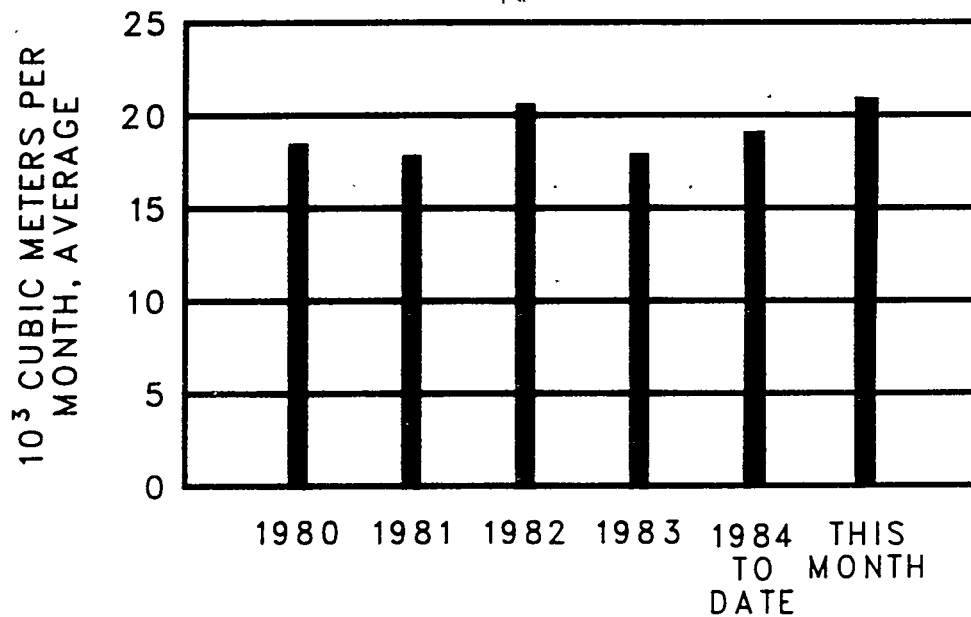


Fig. 5. Process Waste Volumes Treated in the PWT.

ORNL-DWG 83C-11101B

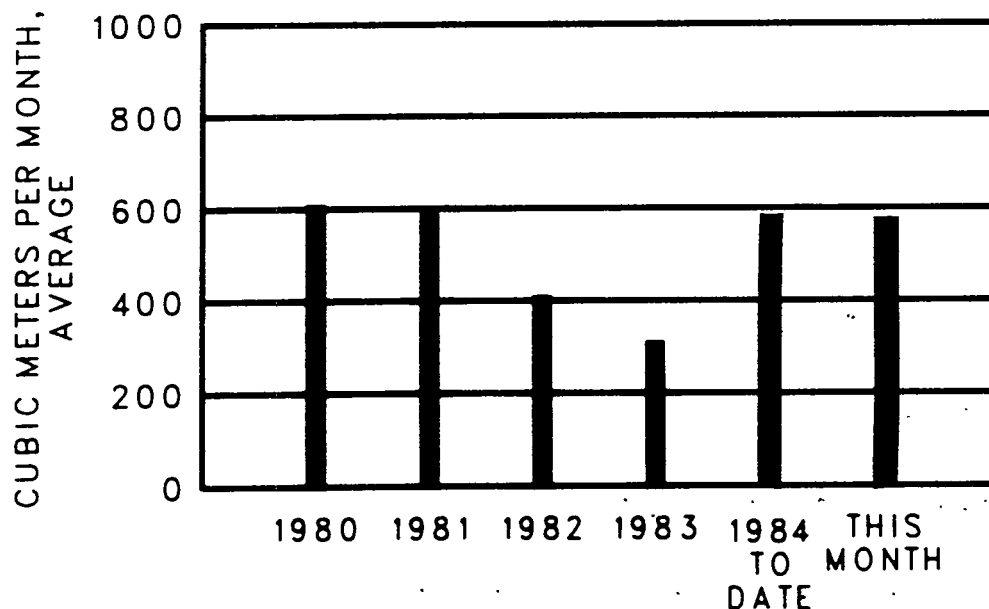


Fig. 6. Liquid Low-Level Waste Volume Generated This Month.

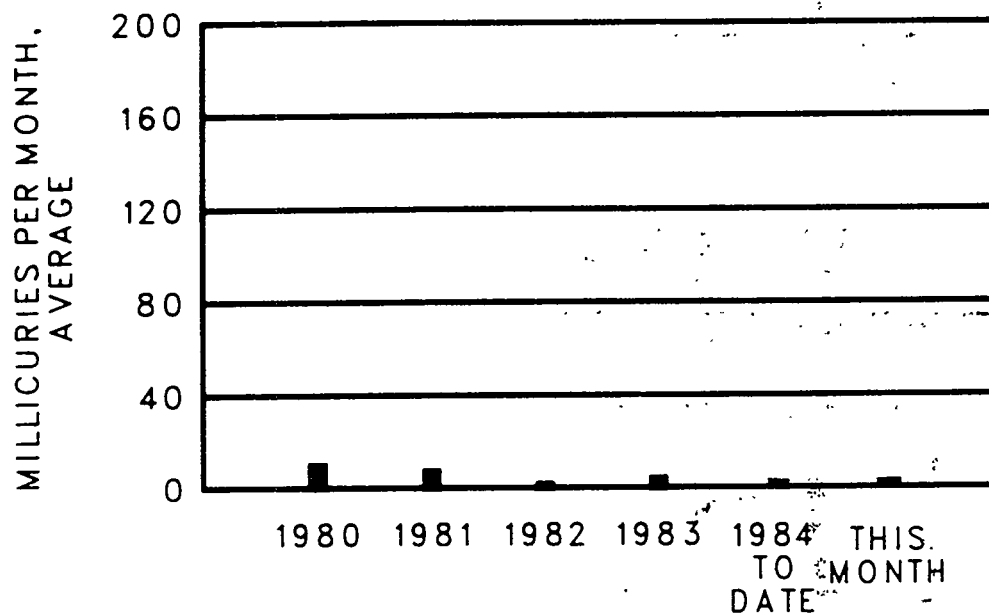


Fig. 7. Total Activity Released in Gaseous Waste (mainly ^{131}I , not including rare gases or other non-filterable species). Maximum Permissible Operating Level Is 13 Ci/Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.280	0.255
Discharge from Melton Valley Operations and Burial Ground 5	4	0.067	0.920
Discharge from Liquid LLW Pits and Trenches	East Weir	<0.001	-----
Discharge from Liquid LLW Pits Burial Ground 6	West Weir	0.010	-----
Total Discharge from All Sources		0.357	1.175
White Oak Dam to Clinch River (EOS Measurements)		0.360	0.790

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	3400	0.212	15.0	2.31	7.6
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.219 ^a	15.5	2.12	7.0
Reactor Operations (MH 112)	23	0.004	0.3	6.13	20.1
Buildings 3503 and 3508 (MH 229)	1	<0.001	---	2.23	7.3
Buildings 3025 and 3026 (MH 149)	29	<0.001	---	1.55	5.1
Building 3019 (MH 25)	610	<0.033	2.3	2.01	6.6
Waste Evaporator, Bldg. 2531 (MH 243)	1300	0.150	10.6	4.28	14.0
Building 3525 (MH 235)	2.8	<0.001	---	0.38	1.2
Building 2026 (MH 240)	1.8	<0.001	---	1.1	3.6
Tank Farm Drainage	3500	0.795	56.2	8.40	27.5

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (mCi)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	<0.001	<1
Central Radioactive Gas Disposal Facilities	3039	1.9	354
Radiochemical-Processing Pilot Plant	3020	<0.001	3
MSRE	7512	<0.001	<1
HFIR and TRU	7911	1.9	14
Activity in Gases Released at X-10 Site		3.8	3.71
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		2(³ H)	---
Building 4508 Ventilation Discharges Room 136 Room 265			No sample 1×10^{-4}
Building 5505 Discharges Glove Box Hood			5.2×10^{-4} 5.8×10^{-3}

^aActivity primarily ¹³¹I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

DATE ISSUED JAN

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-84/419

DATE: November 29, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS
AND EFFLUENT MONITORING REPORT FOR THE MONTH OF JUNE 1984

TO: Distribution

FROM: L. C. Lasher ²⁷

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

David C. Harkin 7/15/90
Technical Information Officer Date
ORNL Site

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SUMMARY

A total of 79 mCi of ^{90}Sr was discharged to White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated flood-plains, and the dormant pit disposal area accounted for 93% of this total. The Environmental and Occupational Safety Division measured a 98 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. Approximately 332 mCi of ^{131}I were emitted with the gaseous waste from the ORNL stacks.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of June was 0.1% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 6.3% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.098 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were $45.4 \times 10^4 \text{ m}^3$ and $4.9 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 79 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were as follows: A total of 0.2 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.5 mCi of ^{90}Sr was released from the 190 pond system, and a total of 11.1 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the liquid LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	7.3	
190 Ponds	0.5	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>11.1</u>	
	19.1	
7500 Sampling Station	44.0	
Burial Grounds 1 and 3 and Floodplains		24.9
Station 3	36	
Burial Ground 4		11.1

Melton Branch

7900 Area (HFIR and TRU)	<0.1	
7500 Area (NSPP and MSRE)	<u>5.5</u>	
	5.5	
Station 4	37	
Burial Ground 5		31.5

Liquid LLW Pit Disposal Area

East Weir	<0.1	
West Weir	<u>6.4</u>	
	6.4	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	79.4	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		73.9
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		93.1

Process Waste

A total of $1.63 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.50 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 29 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	35.5	22.0	27.7
Volume treated (m^3)	524	370	440

Liquid Low-Level Waste

Both of the evaporator systems were operated in parallel during the month. The average boil-down rate was $0.43 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Total Volume Generated	307.5
Volume Transferred to Evaporators	272.3
South Tank Farm Inventory:	
Beginning of Month	226.0
End of Month	226.0
Service Tank Inventory:	
W-21, Beginning of Month	68.0
W-21, End of Month	67.9
W-22, Beginning of Month	19.5
W-22, End of Month	32.5
W-23, Beginning of Month	98.5
W-23, End of Month	132.7
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	351.8
Total Volume at End of Month	351.8

A list of major contributors of liquid low-level waste is given below.

Figure 6 compares the volumes of liquid LLW generated each month.

	<u>m³</u>
Transuranium Processing Area	0.0
Building 3019	30.1
Building 3525	18.2
Radioisotopes Processing Area	14.0
ORR and BSR	32.2
High Flux Isotope Reactor	53.0
Fission Products Development Laboratory	53.0 ^a
4500 Complex	16.4
Building 3544	75.4

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to the liquid LLW line, since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged 332 mCi¹ of gaseous radioactive ¹³¹I this month. Miscellaneous short-lived nonfilterable radioactive nuclides (an insignificant hazard relative to ¹³¹I, ³H, and noble gas releases) were also detected. The total amount of active particulates released during the period was 105 μ Ci. Inert gases released from the 7911 Stack averaged <0.9% of the calculated maximum permissible operating level for this stack². Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

¹The bulk of this activity was released during a "short-life fission product" run (or runs).

²Comparable data for the 3039 Stack System is not available because of the changeover to the computerized data accumulating system; however, monitoring systems indicate this pollutant to be <5% of the stack maximum permissible operating level.

ORNL-DWG 83C-11098B

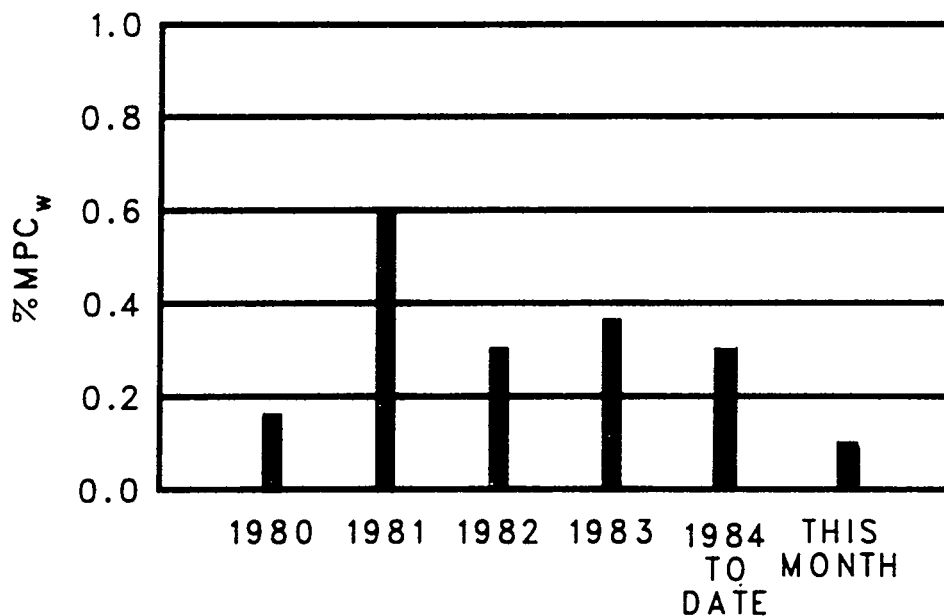


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (EOS Measurements at White Oak Dam).

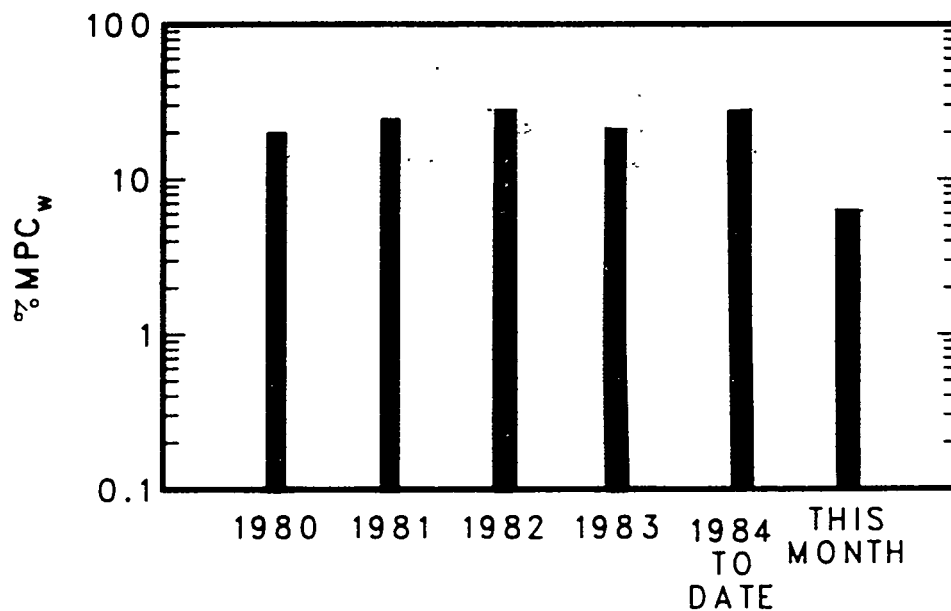


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (EOS Samples at Confluence of White Oak Creek and the Clinch River).

*Assumes complete mixing of White Oak Creek with the Clinch River.

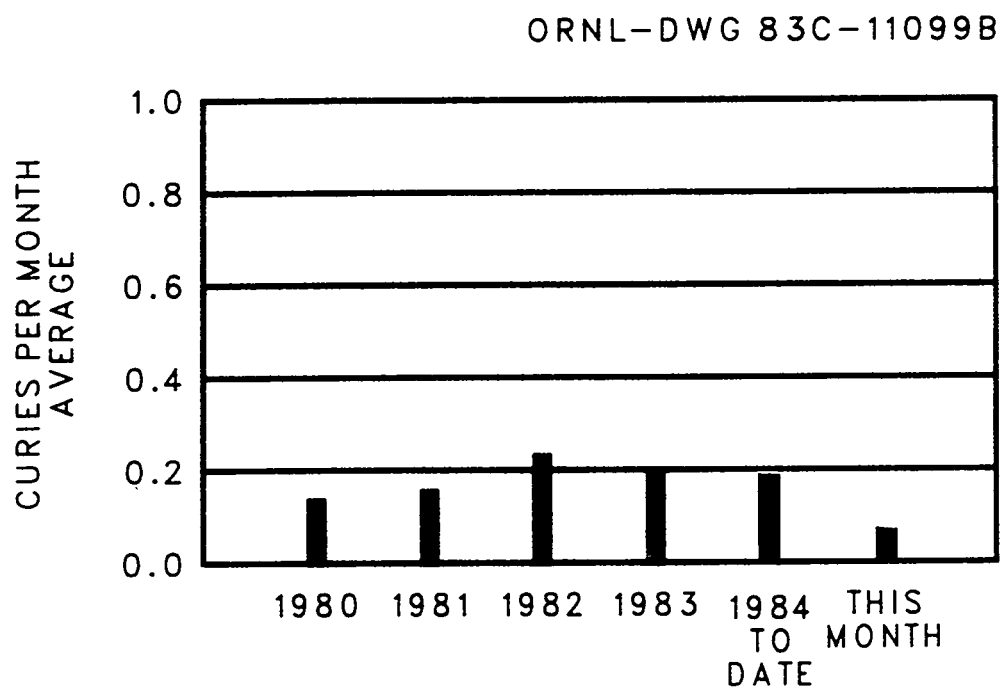


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3)

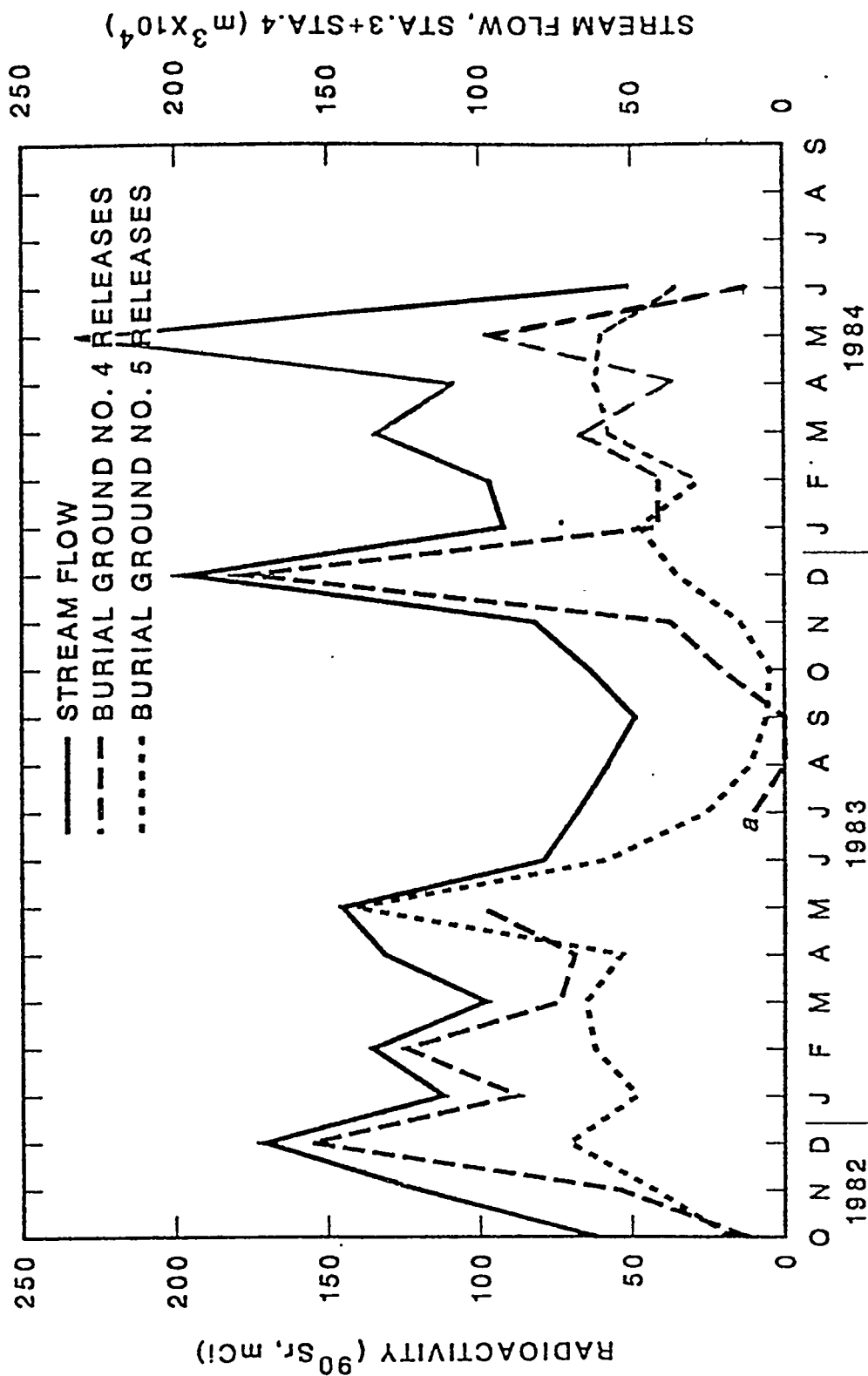


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

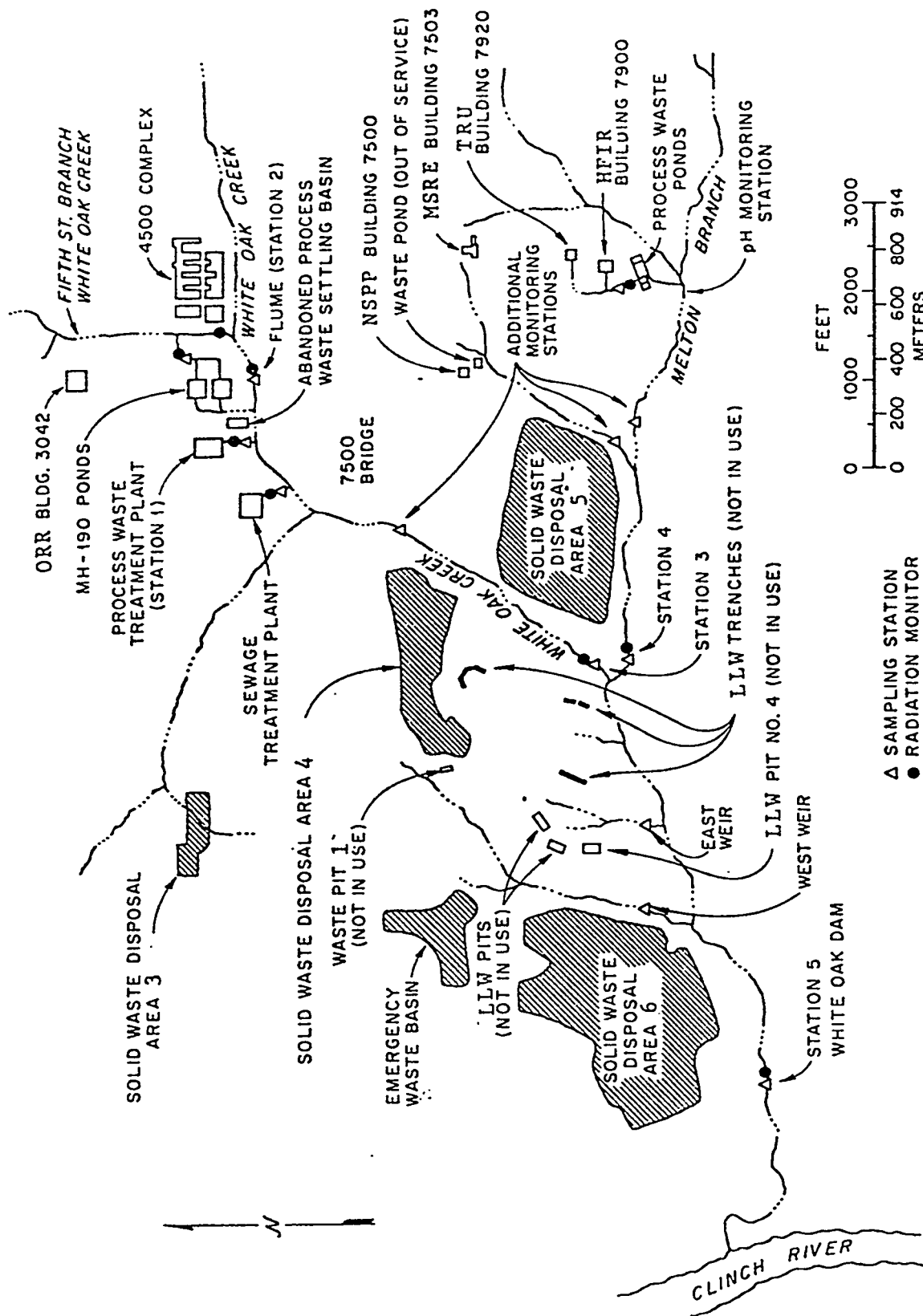


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-111008

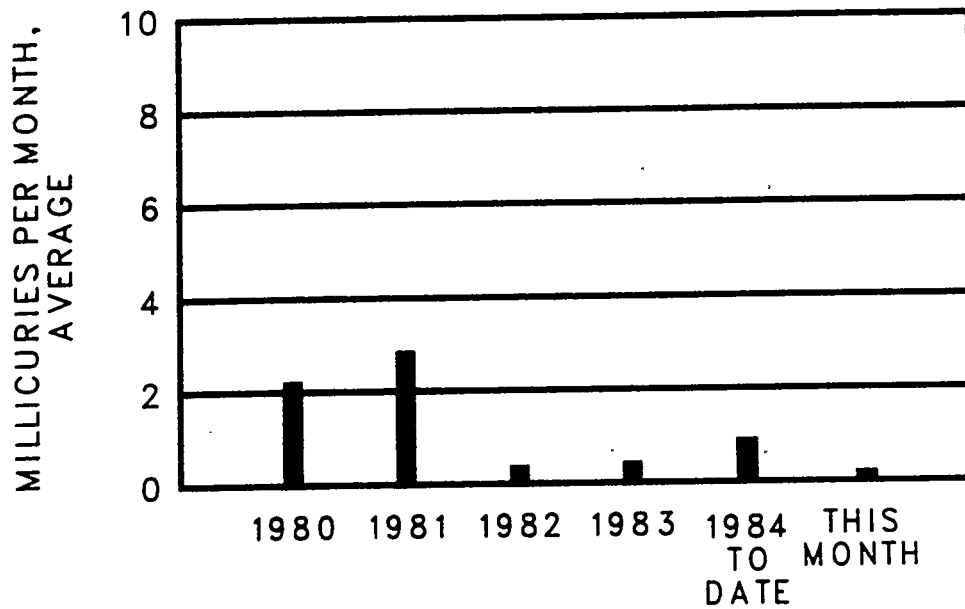


Fig. 4. ^{90}Sr Discharges in Waste From PWTP to White Oak Creek.

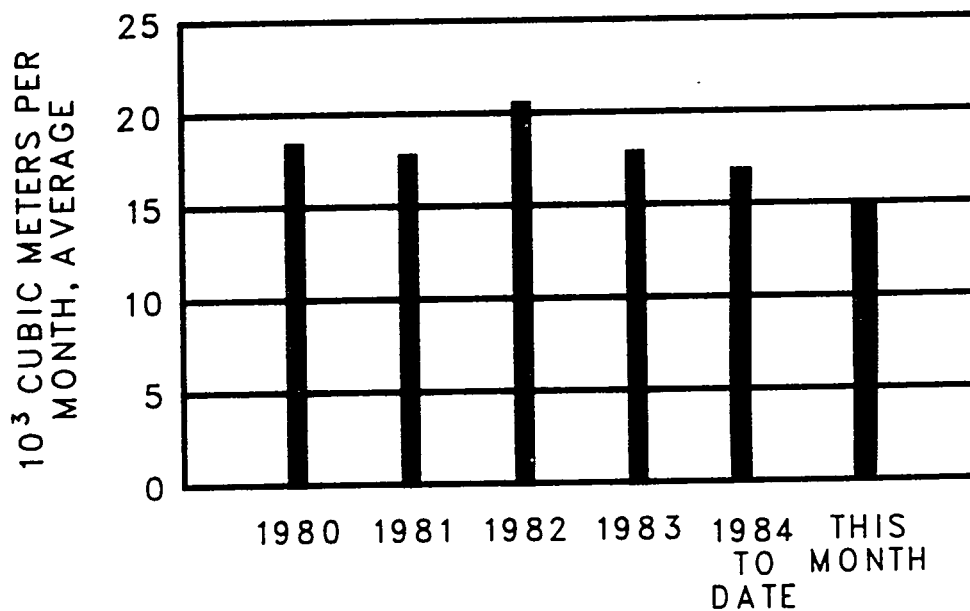


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101B

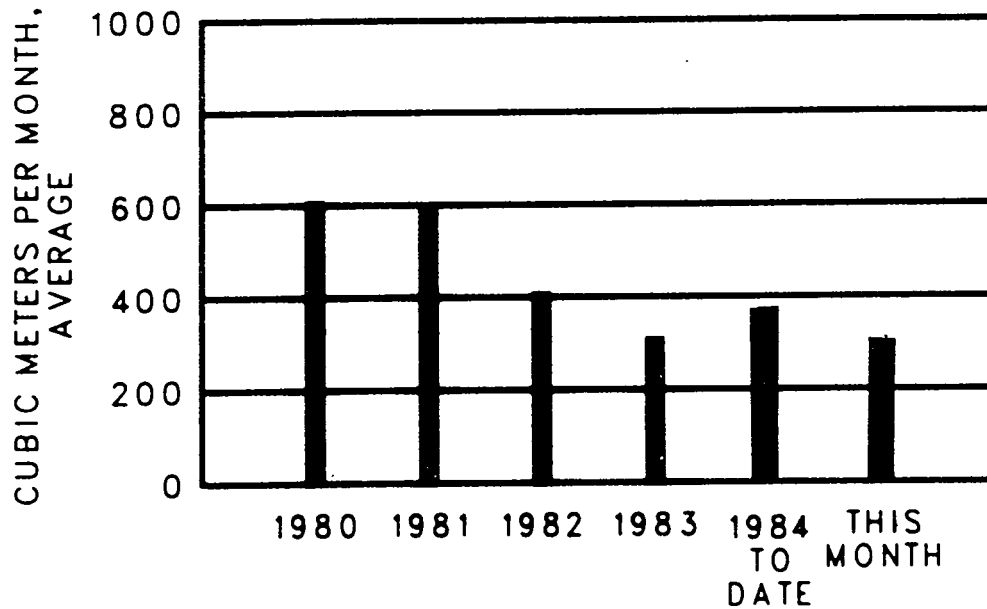


Fig. 6. Liquid Low-Level Waste Volume Generated This Month.

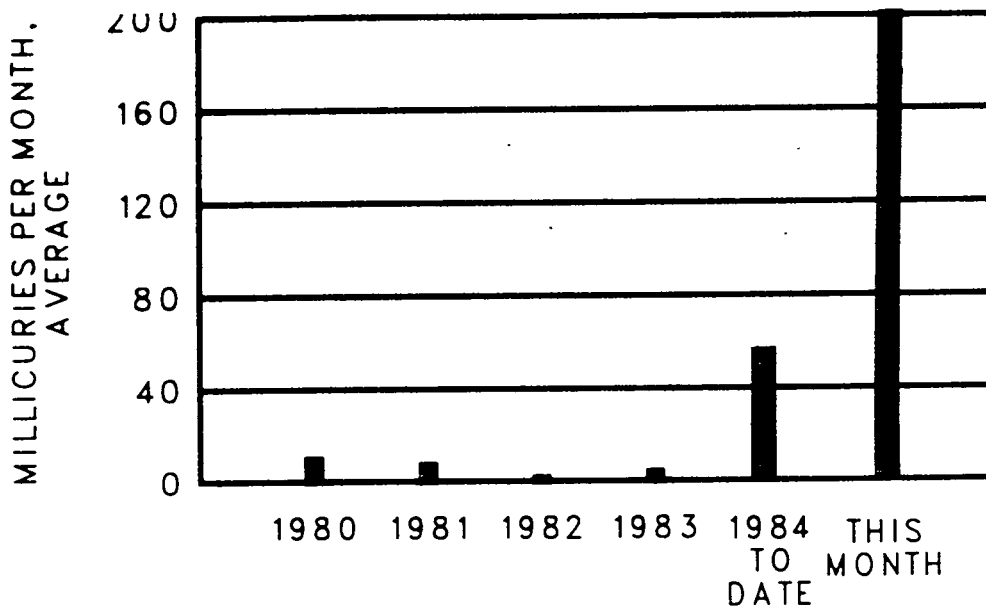


Fig. 7. Total Activity Released in Gaseous Waste (mainly ^{131}I , not including rare gases or other non-filterable species). Maximum Permissible Operating Level Is 13 Ci/Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.036	0.088
Discharge from Melton Valley Operations and Burial Ground 5	4	0.037	0.090
Discharge from Liquid LLW Pits and Trenches	East Weir	<0.001	-----
Discharge from Liquid LLW Pits Burial Ground 6	West Weir	0.006	-----
Total Discharge from All Sources		0.079	0.178
White Oak Dam to Clinch River (EOS Measurements)		0.098	0.210

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	1700	0.207	47.4	4.51	19.3
Radioisotopes Processing Area (MH 114 minus MH 112)	----	0.177 ^a	40.5	1.67	7.2
Reactor Operations (MH 112)	7.4	0.001	0.2	4.92	21.0
Buildings 3503 and 3508 (MH 229)	0.7	<0.001	---	2.10	9.0
Buildings 3025 and 3026 (MH 149)	3	<0.001	---	1.51	6.5
Building 3019 (MH 25)	320	<0.012	2.8	1.34	5.7
Waste Evaporator, Bldg. 2531 (MH 243)	1400	0.029	6.6	2.13	9.1
Building 3525 (MH 235)	5.8	<0.001	---	0.21	0.9
Building 2026 (MH 240)	1.9	<0.001	---	1.17	5.0
Tank Farm Drainage	2800	0.011	2.5	3.82	16.3

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (mCi)	Filterable Particulate Activity ^b (μ Ci)
HRLAL	2026	<0.001	<1
Central Radioactive Gas Disposal Facilities	3039	331	91
Radiochemical-Processing Pilot Plant	3020	<0.001	3
MSRE	7512	<0.001	<1
HFIR and TRU	7911	1	11
Activity in Gases Released at X-10 Site		332	105
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		2(³ H)	---
Building 4508 Ventilation Discharges Room 136			No sample
Room 265			1x10 ⁻⁴
Building 5505 Discharges Glove Box			2.25x10 ⁻⁴
Hood			3.90x10 ⁻³

^aActivity primarily ¹³¹I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

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POST OFFICE BOX X, OAK RIDGE, TENNESSEE 37831

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-84/429

DATE: December 10, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF JULY 1984

TO: Distribution

FROM: L. C. Lasher ²⁷

Sponsor: J. H. Swanks ²⁷

This document has been approved for release
to the public by:

David R. Hamann 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

A total of 136 mCi of ^{90}Sr was discharged to White Oak Lake from ORNL sources; drainage from the burial grounds, contaminated flood-plains, and the dormant pit disposal area accounted for 78% of this total. The Environmental and Occupational Safety Division measured a 170 mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as short-lived mixed fission products; the total ^{131}I release was less than 47 mCi.

There was one Unusual Occurrence reported during this period.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of July was 0.2% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 18.0% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.170 Ci of ⁹⁰Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were $73.4 \times 10^4 \text{ m}^3$ and $8.7 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 134 mCi of ⁹⁰Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were as follows: A total of 0.04 mCi of ⁹⁰Sr was released by the Process Waste Treatment Plant, 0.5 mCi of ⁹⁰Sr was released from the 190 pond system, and a total of 13 mCi of ⁹⁰Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the liquid LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	10.0	
190 Ponds	0.5	
Process Waste Treatment Plant	0.04	
Sewage Treatment Plant	<u>13.0</u>	
	23.5	
7500 Sampling Station	90.0	
Burial Grounds 1 and 3 and Floodplains		66.5
Station 3	93.0	
Burial Ground 4		3.0

Melton Branch

7900 Area (HFIR and TRU)	Not Applicable	
7500 Area (NSPP and MSRE)	<u>5.8</u>	
	5.8	
Station 4	41	
Burial Ground 5		35.2

Liquid LLW Pit Disposal Area

East Weir	<0.3	
West Weir	<u>1.2</u>	
	1.5	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 Plus Ground Disposal Area)	135.5	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		106.2
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		78.3

Process Waste

A total of $2.18 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.95 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 29 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	38.5	21.0	28
Volume treated (m^3)	522	306	406

Liquid Low-Level Waste

The annex evaporator 2-A2 is currently out of service for heating coil evaluation and repairs to the service pipe systems. The average boil-down rate of the A-2 system was 0.50 m³/h.

A summary of storage operations is given below:

	<u>m³</u>
Total Volume Generated	440.3
Volume Transferred to Evaporators	369.1
South Tank Farm Inventory:	
Beginning of Month	226.0
End of Month	226.0
Service Tank Inventory:	
W-21, Beginning of Month	67.9
W-21, End of Month	100.4
W-22, Beginning of Month	32.5
W-22, End of Month	52.6
W-23, Beginning of Month	132.7
W-23, End of Month	61.2
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	351.8
Total Volume at End of Month	495.0

A list of major contributors of liquid low-level waste is given below.

Figure 6 compares the volumes of liquid LLW generated each month.

	<u>m³</u>
Transuranium Processing Area	16.9
Building 3019	40.8
Building 3525	15.9
Radioisotopes Processing Area	27.2
ORR and BSR	36.3
High Flux Isotope Reactor	66.3
Fission Products Development Laboratory	34.8 ^a
4500 Complex	38.8
Building 3544	125.6

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to the liquid LLW line, since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged 47 mCi of gaseous radioactive ¹³¹I this month. The total amount of active particulates released during the period was 109 μ Ci. Inert gases released from the 7911 Stack averaged <0.3% of the calculated maximum permissible operating level for this stack. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

Unusual Occurrence

Unusual Occurrence Report No. ORNL 84-5-OP-84-1 was filed during the reporting period. The event occurred when liquid low-level waste (LLW) collection tank W.1A was unintentionally pressurized causing radioactive vapor to be exhausted via the tank vent system. The resultant surface contamination was minor, and the exposed area was decontaminated with a 4-manhour effort.

ORNL-DWG 83C-11098B

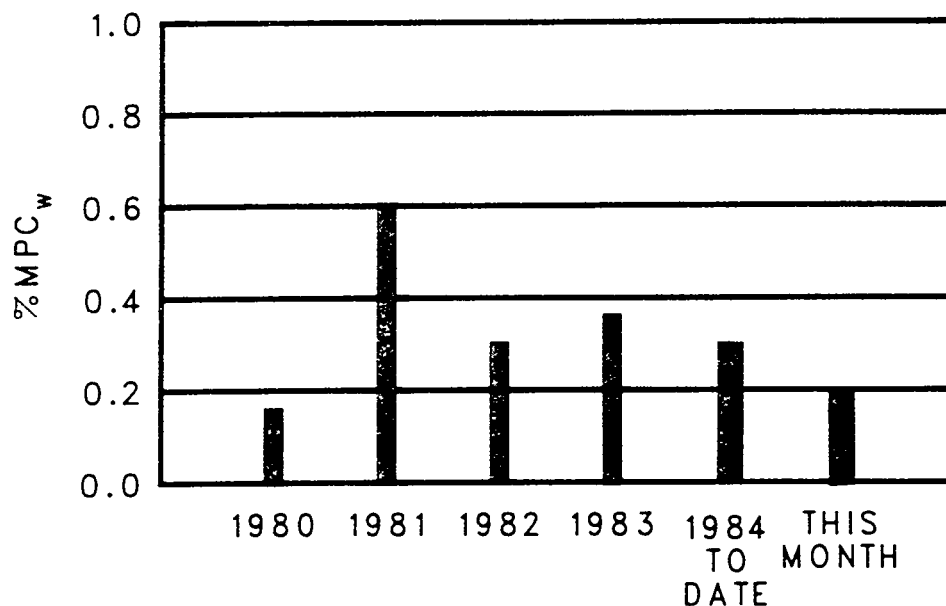


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (EOS Measurements at White Oak Dam).

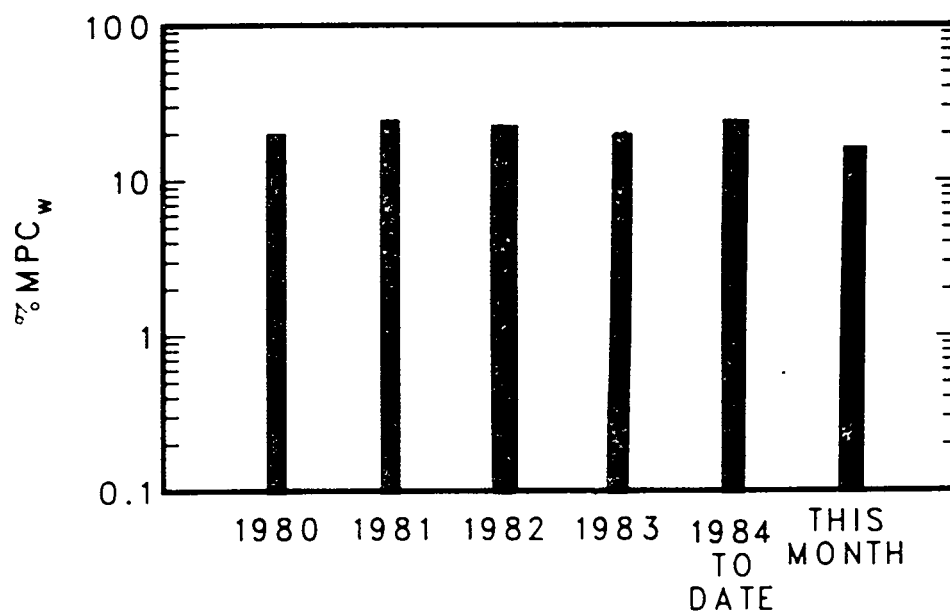


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (EOS Samples at Confluence of White Oak Creek and the Clinch River).

*Assumes complete mixing of White Oak Creek with the Clinch River.

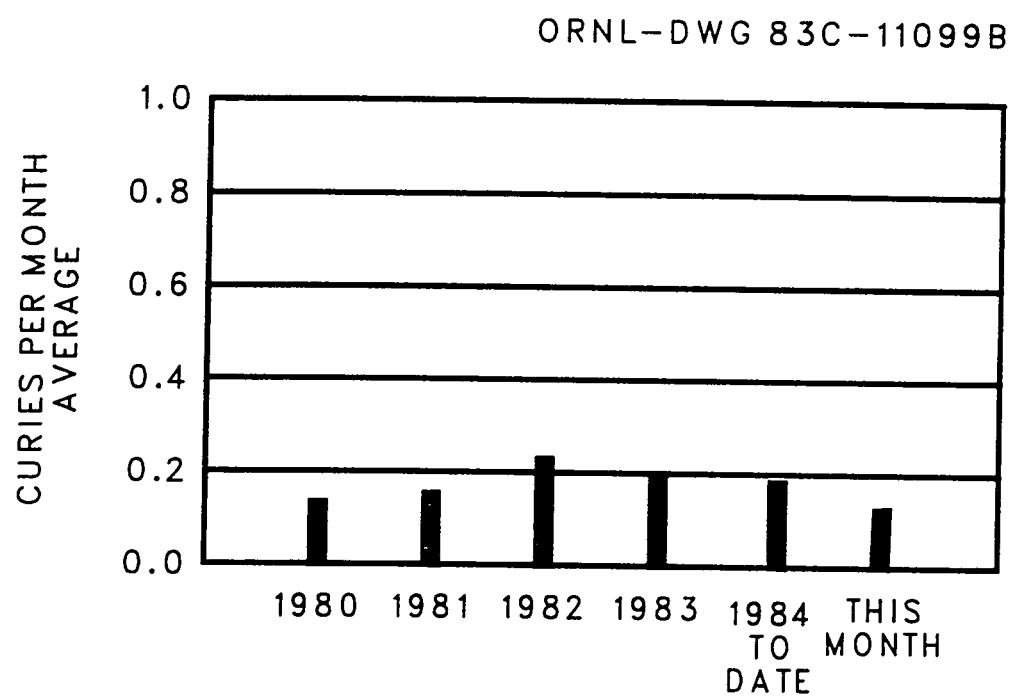


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig.3)

ORNL-DWG 84C-8672A

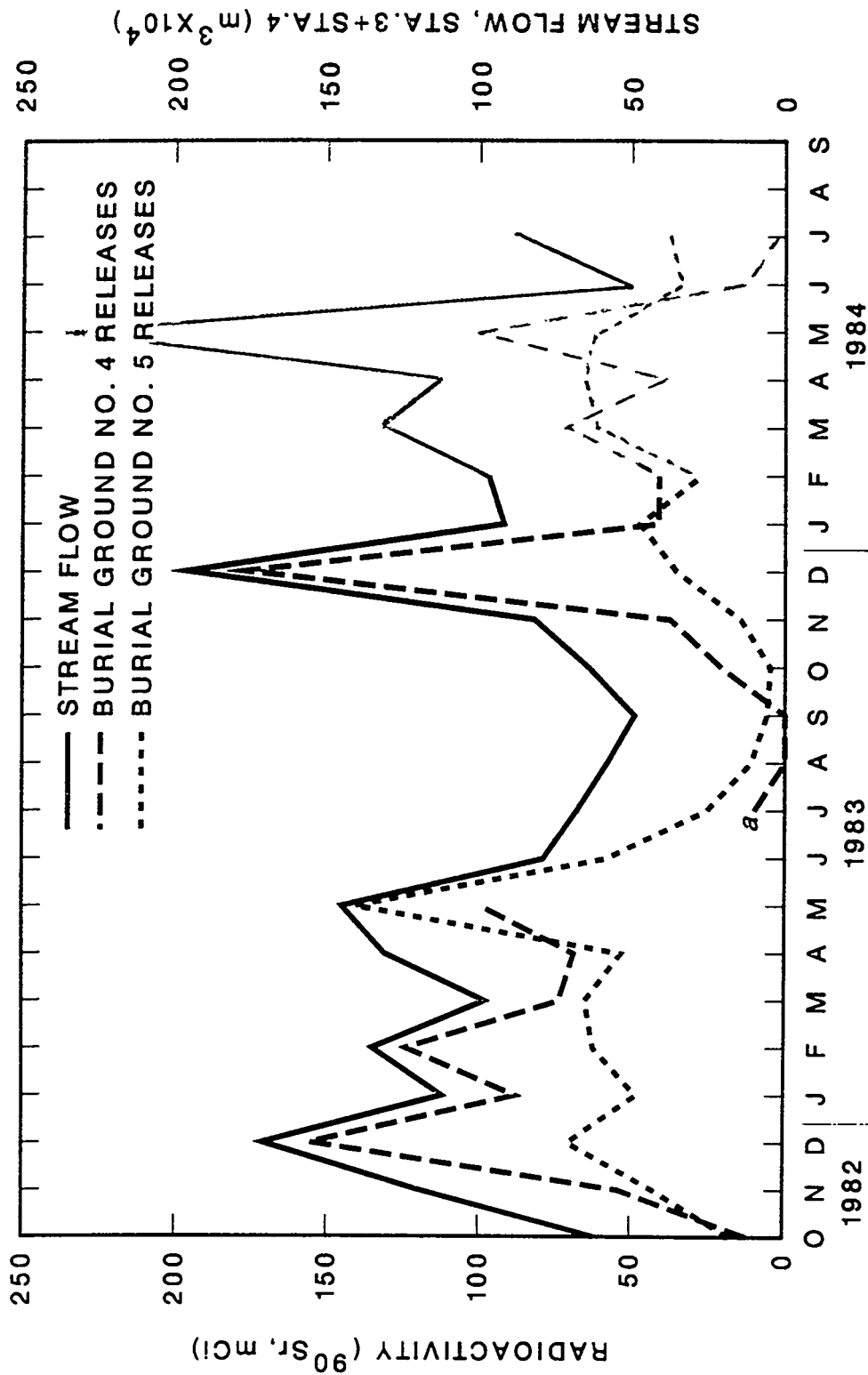


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample inadvertently lost.

ORNL-DWG 78-1024GN2

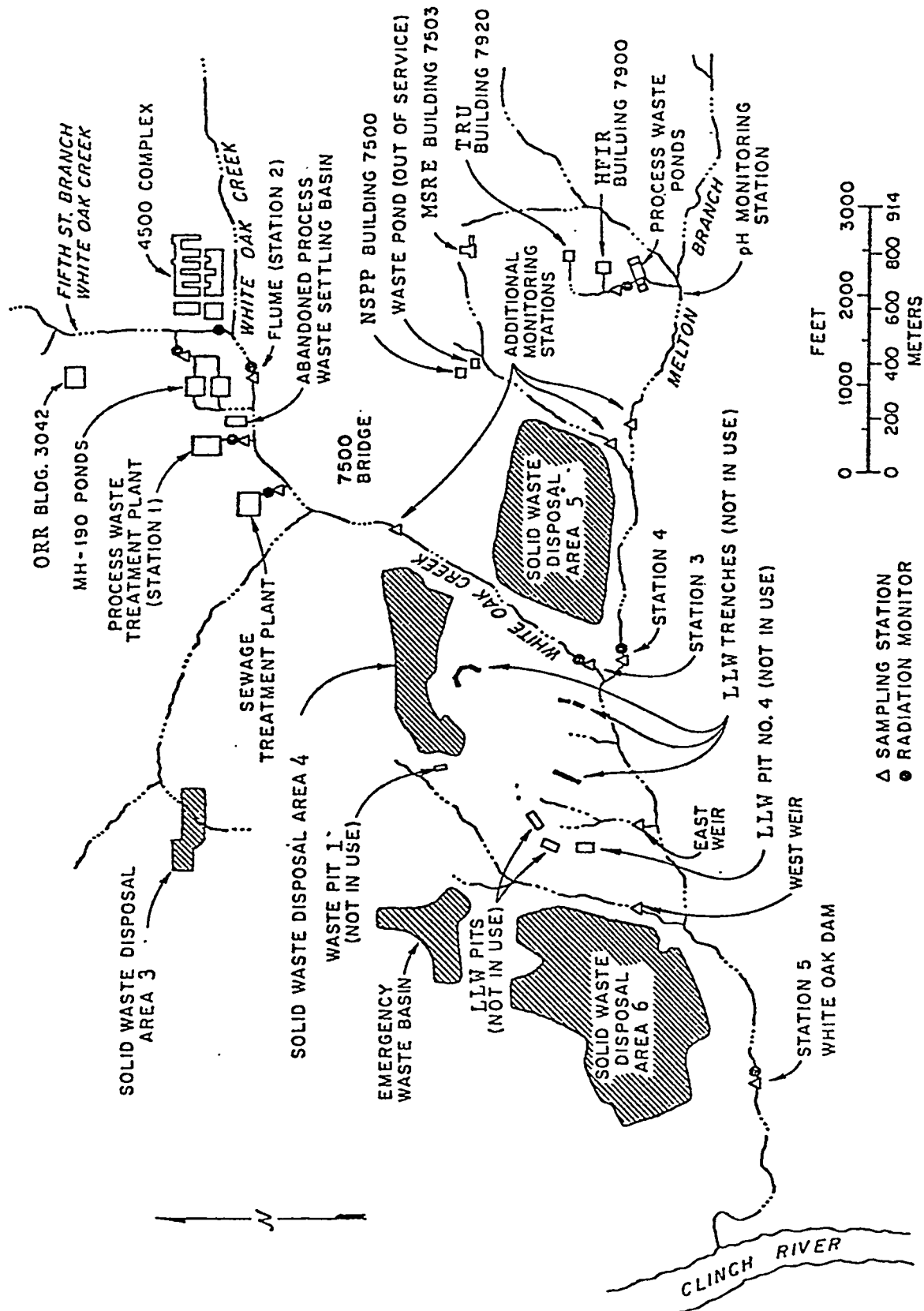


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100B

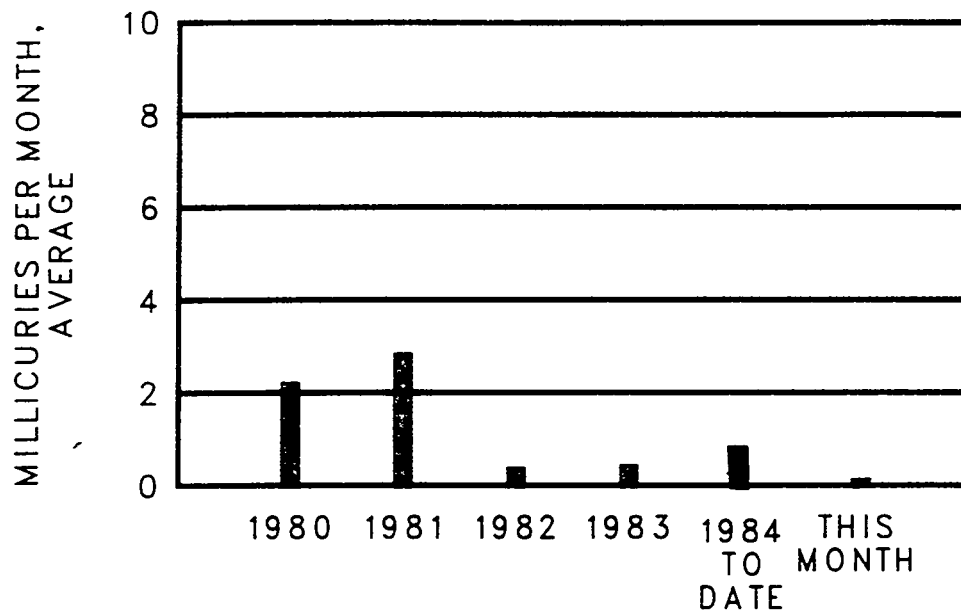


Fig. 4. ^{90}Sr Discharges in Waste from PWTP to White Oak Creek.

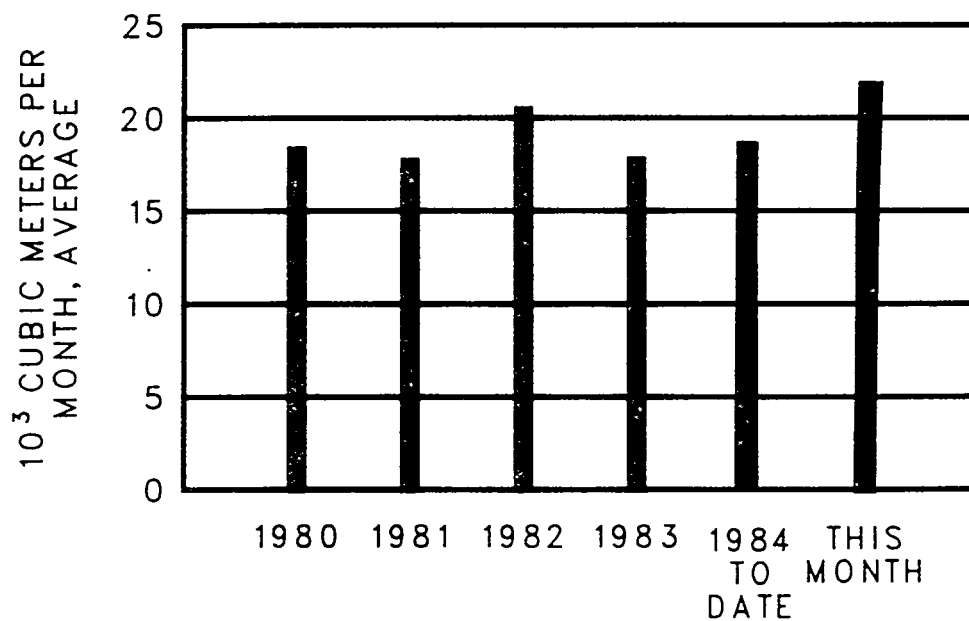


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101B

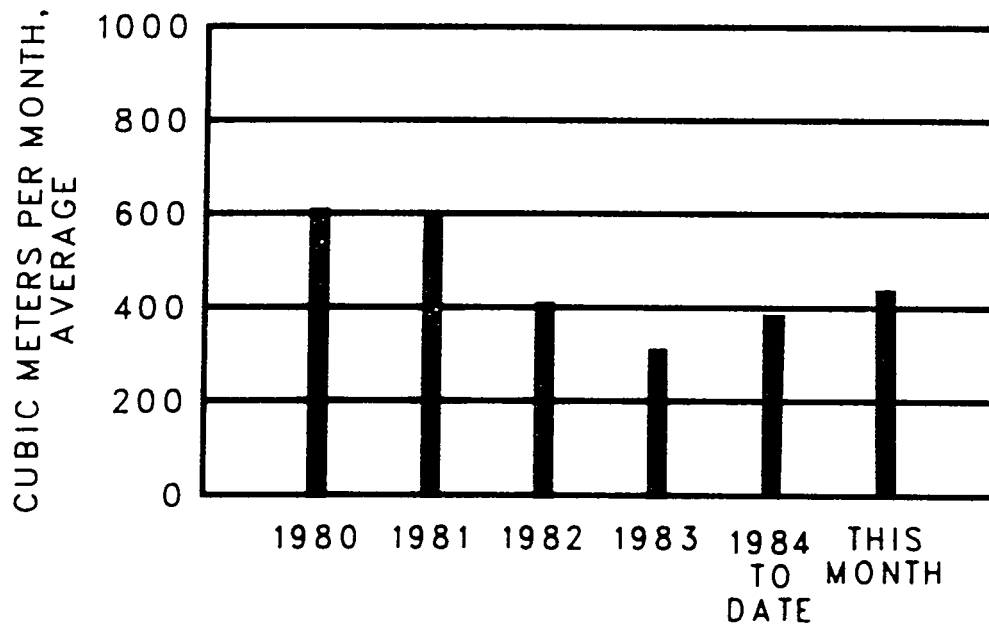


Fig. 6. Liquid Low-Level Waste Volume Generated This Month.

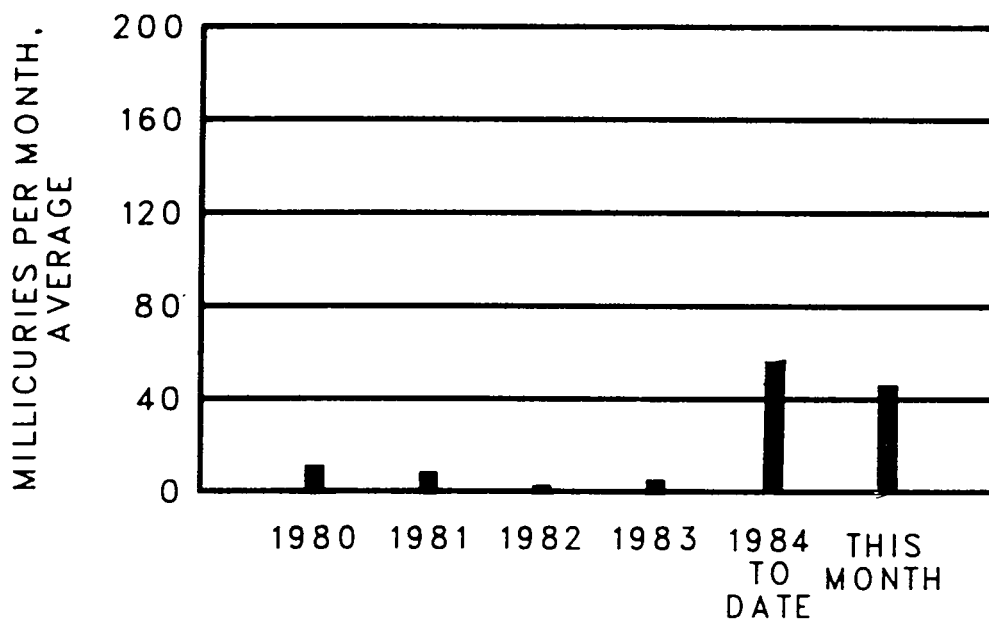


Fig. 7. Total Activity Released in Gaseous Waste (mainly ^{131}I , not including rare gases or other non-filterable species). Maximum Permissible Operating Level Is 13 Ci/Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.093	0.202
Discharge from Melton Valley Operations and Burial Ground 5	4	0.041	0.086
Discharge from Liquid LLW Pits and Trenches	East Weir	<0.001	-----
Discharge from Liquid LLW Pits Burial Ground 6	West Weir	0.001	-----
Total Discharge from All Sources		0.135	-----
White Oak Dam to Clinch River (EOS Measurements)		0.170	0.380

^aRefers to Figure 3.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	1400	0.160	20.7	4.24	15.7
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.200 ^a	25.9	1.85	6.9
Reactor Operations (MH 112)	26	0.004	0.5	6.02	22.3
Buildings 3503 and 3508 (MH 229)	1.2	<0.001	---	2.35	8.7
Buildings 3025 and 3026 (MH 149)	4.8	<0.001	---	1.59	5.9
Building 3019 (MH 25)	1100	<0.044	5.7	1.47	5.5
Waste Evaporator, Bldg. 2531 (MH 243)	590	0.039	5.1	2.47	9.1
Building 3525 (MH 235)	5	<0.001	---	0.55	2.0
Building 2026 (MH 240)	0.4	<0.001	---	1.25	4.6
Tank Farm Drainage	3000	0.325	42.1	5.22	19.3

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (mCi)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	<0.001	<1
Central Radioactive Gas Disposal Facilities	3039	≤ 46	94
Radiochemical-Processing Pilot Plant	3020	<0.001	2
MSRE	7512	<0.001	<0.1
HFIR and TRU	7911	≤ 1	13
Activity in Gases Released at X-10 Site		≤ 47	109
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		(c)	----
Building 4508 Ventilation Discharges			No sample
Room 136			
Room 265			2.46×10^{-5}
Building 5505 Discharges			
Glove Box			3.8×10^{-5}
Hood			3.6×10^{-3} -

^aActivity primarily ^{131}I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

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ORNL
CENTRAL FILES NUMBER

ORNL/CF-84/430

DATE: December 18, 1984

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF AUGUST 1984

TO: Distribution

FROM: L. C. Lasher *27*

Subject: J. H. Swanks

This document has been approved for release
to the public by:

Dwight R. Hamlin *7/15/86*
Technical Information Officer Date
ORNL Site

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Internal release procedures (D-8.5)

SUMMARY

Operation of the Waste Monitoring and Collection Systems for the month of August was routine. The total amount of ^{90}Sr discharged into White Oak Lake from ORNL sources was 108 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 77% of this total. The Environmental and Occupational Safety Division measured a 140 mCi release of ^{90}Sr at the White Oak Dam sample station ($0.1\% \text{ MPC}_W$ in the Clinch River for recorded flows). The measured release of gaseous ^{131}I from the ORNL stack systems was approximately 3 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of August was 0.1% of the MPC_W (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 12.0% of the MPC_W (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC_W in the river that could result from ORNL waste releases.

During the month, 0.140 Ci of ^{90}Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 68.1×10^4 and $7.9 \times 10^4 \text{ m}^3$, respectively. Figure 2A shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 107 mCi of ^{90}Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of ^{90}Sr was released by the Process Waste Treatment Plant, 0.3 mCi of ^{90}Sr was released from the 190 pond system, and a total of 12.0 mCi of ^{90}Sr was released from the sanitary system.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the liquid LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 3).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	7.9	
190 Ponds	0.3	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	12.0	
	<u>20.4</u>	
7500 Sampling Station	55.0	
Burial Grounds 1 and 3 and Floodplains		34.6
Station 3	79.0	
Burial Ground 4		24.0

Melton Branch

7900 Area (HFIR and TRU)	Not Applicable	
7500 Area (NSPP and MSRE)	4.0	
	<u>4.0</u>	
Station 4	28	
Burial Ground 5		24.0

Liquid LLW Pit Disposal Area

East Weir	0.1	
West Weir	0.5	
	<u>0.6</u>	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 Plus Ground Disposal Area)	107.6	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		83.2
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		77.3

Process Waste

A total of $1.93 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $1.79 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 4; the waste volume processed, compared to previous months, is shown in Fig. 5. The main contributors to the system are listed in Table 2. A total of 34 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	38.5	23	28.6
Volume treated (m^3)	557	339	443

Liquid Low-Level Waste

The annex evaporator 2-A2 remained out of service during the period pending completion of service pipe repairs. The average boil-down rate of the A-2 system was 0.48 m³/h.

A summary of storage operations is given below:

	<u>m³</u>
Total Volume Generated	236.9
Volume Transferred to Evaporators	353.9
South Tank Farm Inventory:	
Beginning of Month	226.0
End of Month	226.0
Service Tank Inventory:	
W-21, Beginning of Month	100.5
W-21, End of Month	27.9
W-22, Beginning of Month	52.4
W-22, End of Month	43.5
W-23, Beginning of Month	62.1
W-23, End of Month	93.5
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	495.0
Total Volume at End of Month	525.7

A list of major contributors of liquid low-level waste is given below. Figure 6 compares the volumes of liquid LLW generated each month.

	<u>m³</u>
Transuranium Processing Area	9.6
Building 3019	38.4
Building 3525	18.2
Radioisotopes Processing Area	24.7
ORR and BSR	3.0
High Flux Isotope Reactor	0
Fission Products Development Laboratory	37.6 ^a
4500 Complex	30.3
Building 3544	64.1

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to the liquid LLW line, since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged 3 mCi of gaseous radioactive ¹³¹I this month. The total amount of active particulates released during the period was 71 μ Ci. Inert gases released from the 7911 Stack averaged <0.9% of the calculated maximum permissible operating level for this stack. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

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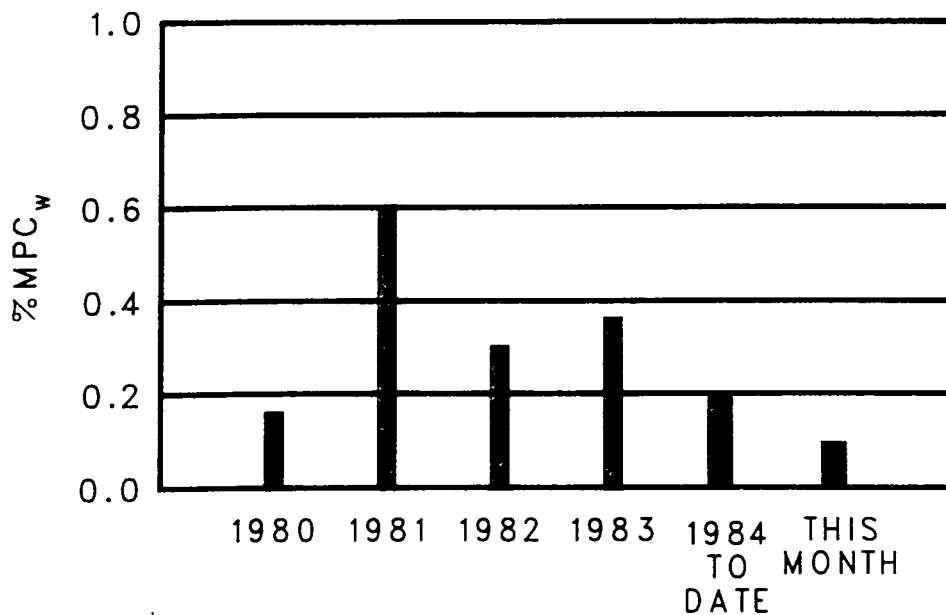


Fig. 1A. Calculated Percent of MPC_w in Clinch River due to ORNL Discharges* (EOS Measurements at White Oak Dam).

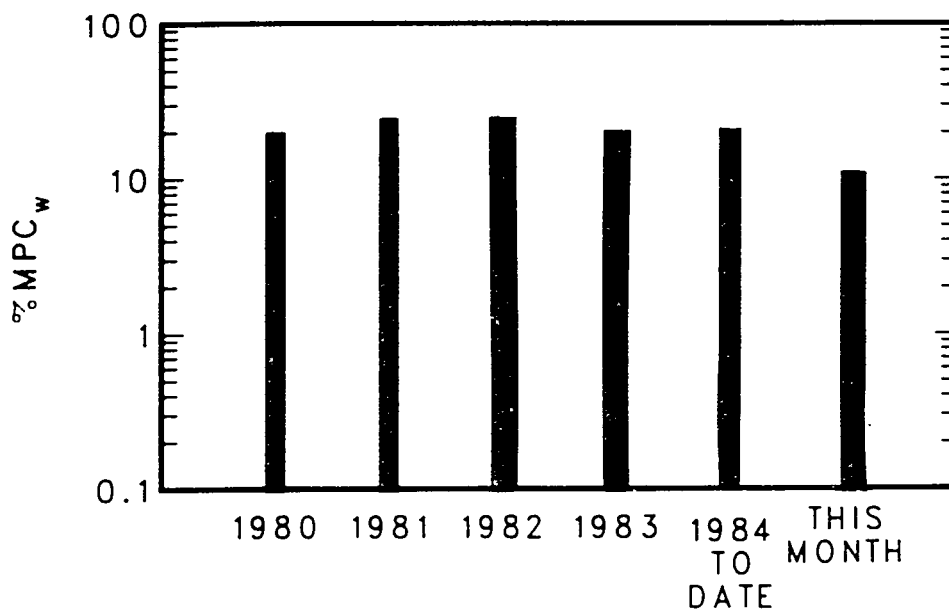


Fig. 1B. Measured Percent of MPC_w in Clinch River due to ORNL Discharges (EOS Samples at Confluence of White Oak Creek and the Clinch River).

*Assumes complete mixing of White Oak Creek with the Clinch River.

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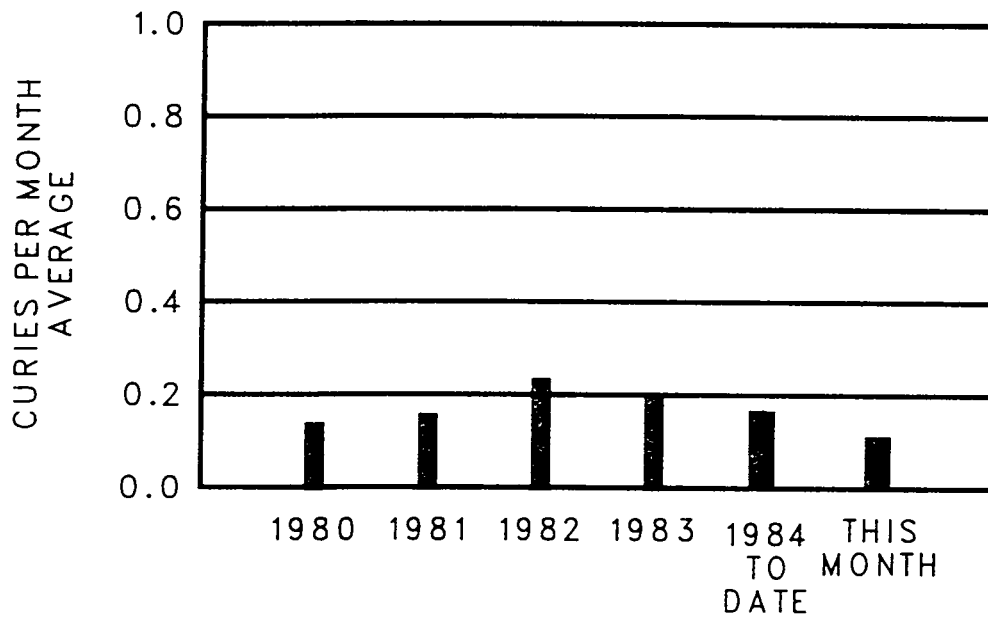


Fig. 2. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3)

ORNL-DWG 84C-8672A

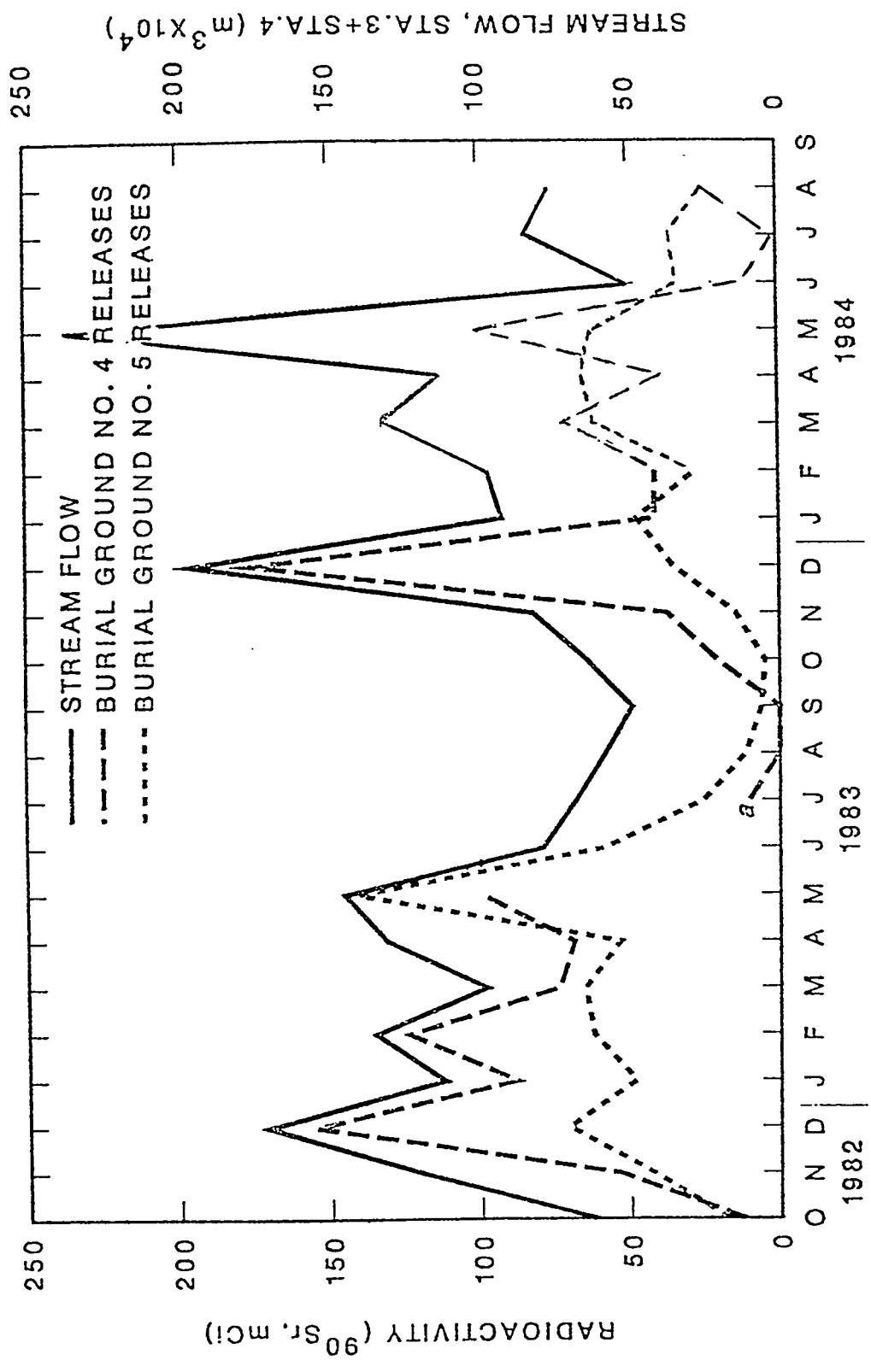


Fig. 2A. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Sample Inadvertently lost.

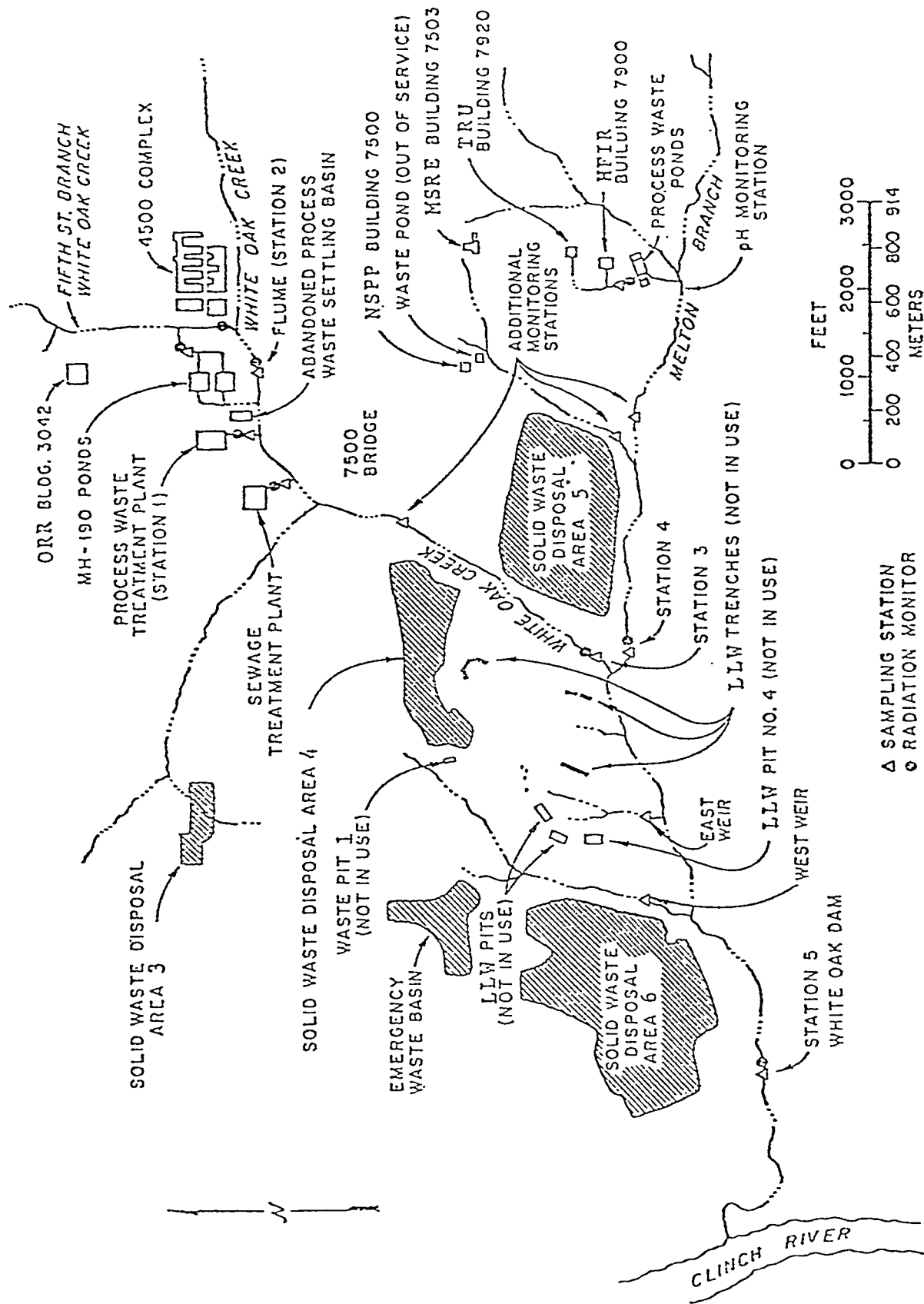


Fig. 3 Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100B

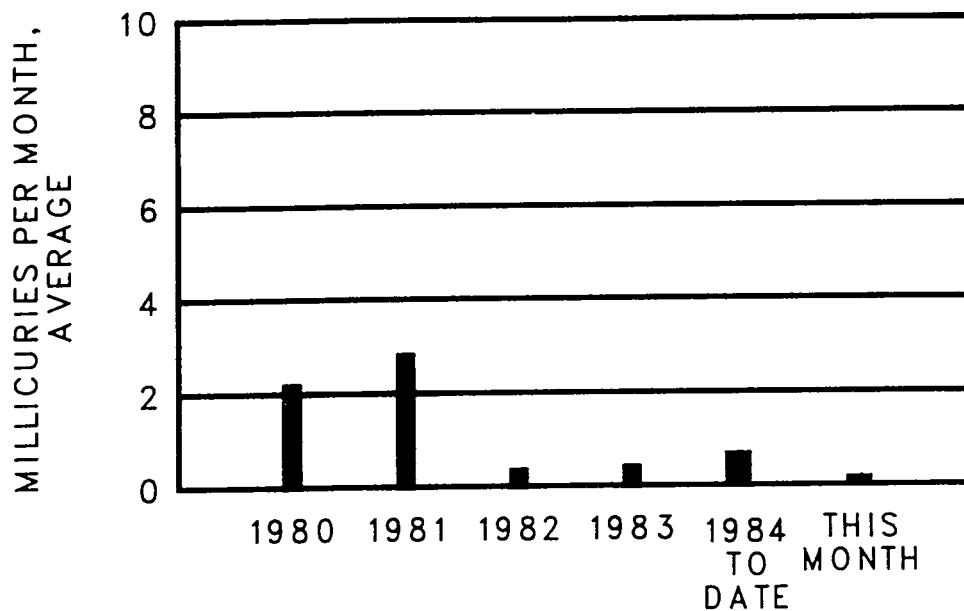


Fig. 4. ^{90}Sr Discharges in Waste From PWTP to White Oak Creek.

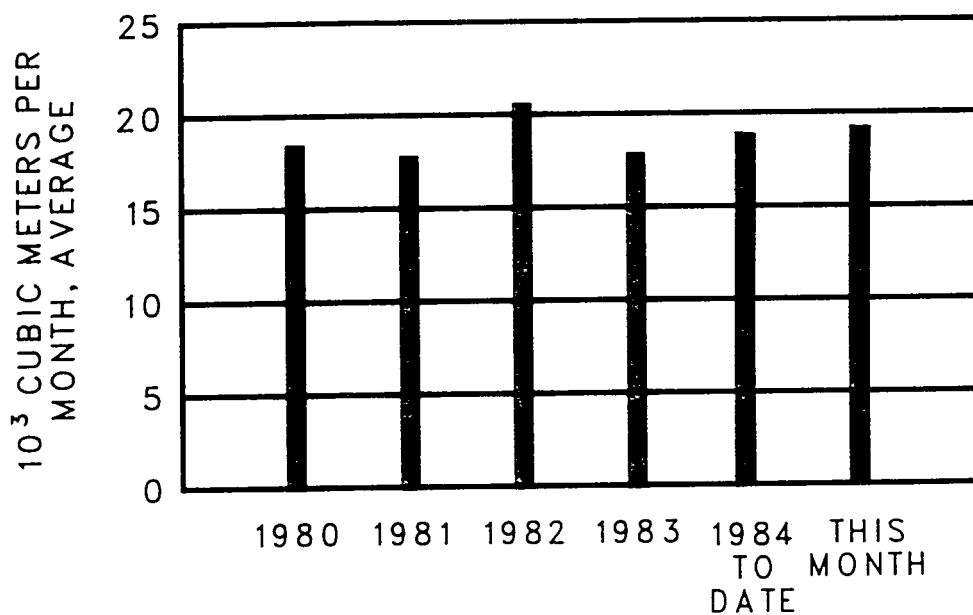


Fig. 5. Process Waste Volumes Treated in the PWTP.

ORNL-DWG 83C-11101B

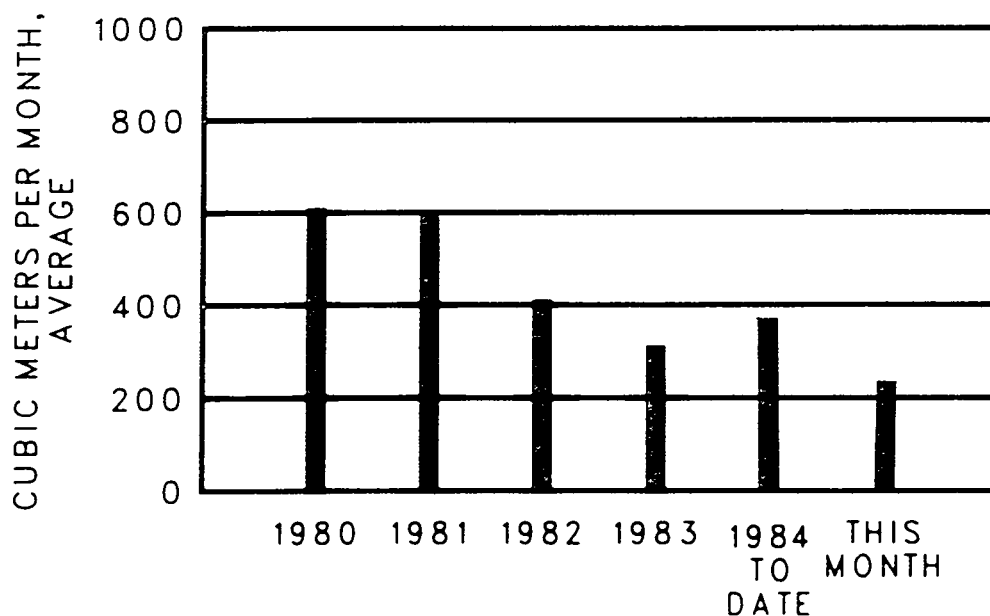


Fig. 6. Liquid Low-Level Waste Volume Generated This Month.

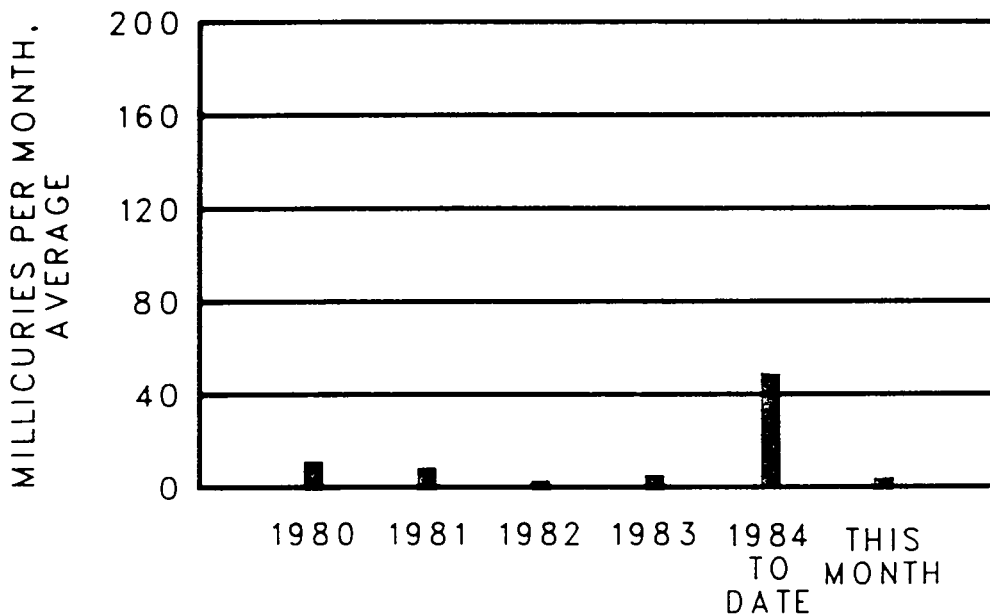


Fig. 7. Total Activity Released in Gaseous Waste (mainly ^{131}I , not including rare gases or other non-filterable species). Maximum Permissible Operating Level Is 13 Ci/Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr, Ci	Gross Beta Ci ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.079	0.155
Discharge from Melton Valley Operations and Burial Ground 5	4	0.028	0.105
Discharge from Liquid LLW Pits and Trenches	East Weir	<0.0001	-----
Discharge from Liquid LLW Pits Burial Ground 6	West Weir	0.0005	-----
Total Discharge from All Sources		0.108	0.260
White Oak Dam to Clinch River (EOS Measurements)		0.140	0.350

^aRefers to Figure 3.^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	CI	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	1600	0.224	27.4	5.19	20.5
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.187 ^a	22.9	1.63	6.5
Reactor Operations (MH 112)	21	0.003	0.4	4.77	18.9
Buildings 3503 and 3508 (MH 229)	0.75	<0.001	---	2.65	10.5
Buildings 3025 and 3026 (MH 149)	3.2	<0.001	---	2.01	7.9
Building 3019 (MH 25)	1300	<0.052	6.4	1.48	5.8
Waste Evaporator, Bldg. 2531 (MH 243)	430	0.021	2.6	1.82	7.2
Building 3525 (MH 235)	1.3	<0.001	---	0.49	1.9
Building 2026 (MH 240)	0.65	<0.001	---	1.06	4.2
Tank Farm Drainage	2900	0.329	40.3	4.20	16.6

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	Activity ^a (mCi)	Filterable Particulate Activity ^b (μ Ci)
HLAL	2026	<0.1	<1
Central Radioactive Gas Disposal Facilities	3039	3	67
Radiochemical-Processing Pilot Plant	3020	<0.1	1
MSRE	7512	<0.1	<1
HFIR and TRU	7911	<0.1	3
Activity in Gases Released at X-10 Site		3	71
Chem. Tech. Division - Y-12 Area			(c)
Tritium Target Fabrication Building		(c)	---
Building 4508 Ventilation Discharges Room 136 Room 265			No sample 1.05×10^{-4}
Building 5505 Discharges Glove Box Hood			6.8×10^{-4} 1.2×10^{-2}

^aActivity primarily ^{131}I except as noted. Does not include noble gases.

^bThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

^cNo data available at this time.

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CENTRAL FILES NUMBER

ORNL/CF-85-329

DATE: June 15, 1985

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND
EFFLUENT MONITORING REPORT FOR THE MONTH OF FEBRUARY 1985

TO: Distribution

FROM: L. C. Lasher

Sponsor: J. H. Swanks

This document has been approved for release
to the public by:

David R. Hamm 7/15/96
Technical Information Officer Date
ORNL Site

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SUMMARY

A total of 235 mCi of ^{90}Sr was discharged to White Oak Lake from ORNL sources; drainage from burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 63% of this total. The Environmental and Occupational Safety Division measured a 230-mCi release of ^{90}Sr at the White Oak Dam sample station during the period. The activity emitted with the gaseous waste from the ORNL stacks remained low. The bulk of this contamination was identified as short-lived mixed fission products; the total release of ^{131}I was less than 2 mCi.

RADIOACTIVE EFFLUENTS

Liquid Waste

Release to Clinch River

The resultant dose to the body of an individual drinking water at the confluence of White Oak Creek and the Clinch River is shown in Figure 1. This calculation is based on measurements of radioactivity at this location, and it represents the maximum possible dose that a member of the general public could receive from the ingestion of water released from the ORNL reservation.

The calculated dose resulting from the ingestion of Clinch River water downstream from the White Oak Creek confluence (Fig. 2) is based on the measurement of radioactivity released from White Oak Dam, and it assumes that complete mixing with the river water has occurred.

For all dose calculations based on the ingestion of water, an individual was assumed to drink 2.2 liters per day for the full month covered by this report. The dose calculations are based on assumptions given in ICRP 26/30 and using EPA weighting factors.

A total of 230 mCi of ^{90}Sr was released from White Oak Lake during the period. The H^3 released over the dam amounted to 590 Ci, and the TRU assay was 1.0 mCi at this station. The mean weekly discharges of ^{90}Sr , H^3 , TRU, and gross beta activities are shown in Figs. 3, 4, 5, and 6.

White Oak Creek Monitoring

The strontium and gross beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 7. The total flows for White Oak Creek and Melton Branch, as measured at Stations 3 and 4, were 83.3×10^4 and $20.8 \times 10^4 \text{ m}^3$, respectively. Figure 8 shows the stream flow (Station 3 plus Station 4) and radioactivity releases from Burial Grounds 4 and 5 for recent months.

The White Oak Creek and Melton Branch watersheds discharged a total of 233 mCi of ^{90}Sr into White Oak Lake.

The Process Waste Treatment Plant and the 190 pond system released 0.48 and 0.34 mCi of ^{90}Sr into White Oak Creek during the period. A total of 70 mCi of ^{90}Sr was released from the sanitary waste system. Most of this activity was contained in contaminated ground water which infiltrated the system at the Bldg. 3019 area. The origin of the activity was traced to a broken LLW transfer line which services Bldg. 3074. The contaminated sanitary drain has been by-passed by means of a temporary pumping station.

The following tabulation lists the measured amounts of ^{90}Sr discharged into the White Oak Creek and Melton Branch watersheds and the discharge into White Oak Lake from the LLW pit disposal area. Contributions from Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig. 9).

White Oak Creek

	^{90}Sr Discharge (mCi)	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	7.2	
190 Ponds	0.34	
Process Waste Treatment Plant	0.48	
Sewage Treatment Plant	<u>70.0</u>	
	78.0	
7500 Sampling Station	159	
Burial Grounds 1 and 3 and Floodplains		81
Station 3	180	
Burial Ground 4		21

Melton Branch

7900 Area (HFIR and TRU)	0.14	
7500 Area (NSPP and MSRE)	<u>8.1</u>	
	8.2	
Station 4	53	
Burial Ground 5		45

Liquid LLW Pit Disposal Area

East Weir	0.02	
West Weir	<u>2.3</u>	
	2.3	
Total ^{90}Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	235	
Total ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		147
Percent ^{90}Sr from Burial Grounds, Ground Disposal Area, and Floodplains		63

Process Waste

A total of $2.63 \times 10^4 \text{ m}^3$ of process waste was treated by ion exchange. Of this amount, $2.57 \times 10^4 \text{ m}^3$ were released to White Oak Creek; the remainder was used for process operations such as backwashing of filters.

The strontium activity released from the process waste system to White Oak Creek, compared to previous months, is shown in Fig. 10; the waste volume processed, compared to previous months, is shown in Fig. 11. The main contributors to the system are listed in Table 2. A total of 40 ion exchange column runs was made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run time (h)	34.5	29.0	31.0
Bed Volume Treated (1 BV = 1.3 m^3)	575	399	491

Liquid Low-Level Waste

The source of the activity which infiltrated the sanitary system was traced to the Bldg. 3074 LLW drain which is located immediately north of Bldg. 3019. A chemical ware section of the pipe system was corroded by decontamination fluids used in the building. The damaged section of the line has been removed, and the remaining ends of the line were plugged. Building 3074 will utilize a portable tank system pending installation of a new drain line.

Both of the evaporator systems were operated during the reporting period. The average boildown rate was $0.56 \text{ m}^3/\text{h}$.

A summary of storage operations is given below:

	<u>m^3</u>
Volume Transferred to Service Tanks W-21 or W-22	457.5
Volume of LLW Feed to Evaporators	436.7
Volume of Evaporator Concentrate to W-23	53.3
Service Tank Inventory:	
W-21, Beginning of Month	44.1
W-21, End of Month	64.5
W-22, Beginning of Month	162.8
W-22, End of Month	109.7
W-23, Beginning of Month	155.3
W-23, End of Month	76.7
South Tank Farm Inventory:	
Beginning of Month	266.0
End of Month	261.0
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	795.8
Total Volume at End of Month	965.6*

(Note: Liquid low-level waste is pumped from the area collection tanks into W-21 and W-22, which act as feed tanks for the evaporator. Evaporator concentrate is stored in W-23 prior to transfer to the Melton Valley Storage Tanks).

*This total includes 39.6 m^3 of waste which consists of bleed-back from the NHF well and decontamination fluids which are scheduled for reprocessing by evaporation.

A list of major contributors of low-level waste is given below.

Figure 12 compares the volumes of liquid LLW generated each month.

	<u>m³</u>
Building 3019	29.3
Building 3525	10.5
Radioisotopes Processing Area	57.9
ORR and BSR	71.7
High Flux Isotope Reactor	67.7
Fission Products Development Laboratory	68.7 ^a
4500 Complex	13.1
Building 3544	146.9

^aThe storage tank pit has an inleakage problem from groundwater, and this is the volume of water jetted from the pit during the month. The pit can only be jetted to LLW, since it was designed in this fashion.

Gaseous Waste

The ORNL stacks discharged approximately 2 mCi of gaseous ¹³¹I this month. The total amount of active particulates released during the period was 45 μ Ci. Inert gases released from the 3039 and 7911 Stacks averaged less than 0.54% and 0.12%, respectively, of the calculated maximum permissible operating levels for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 13.

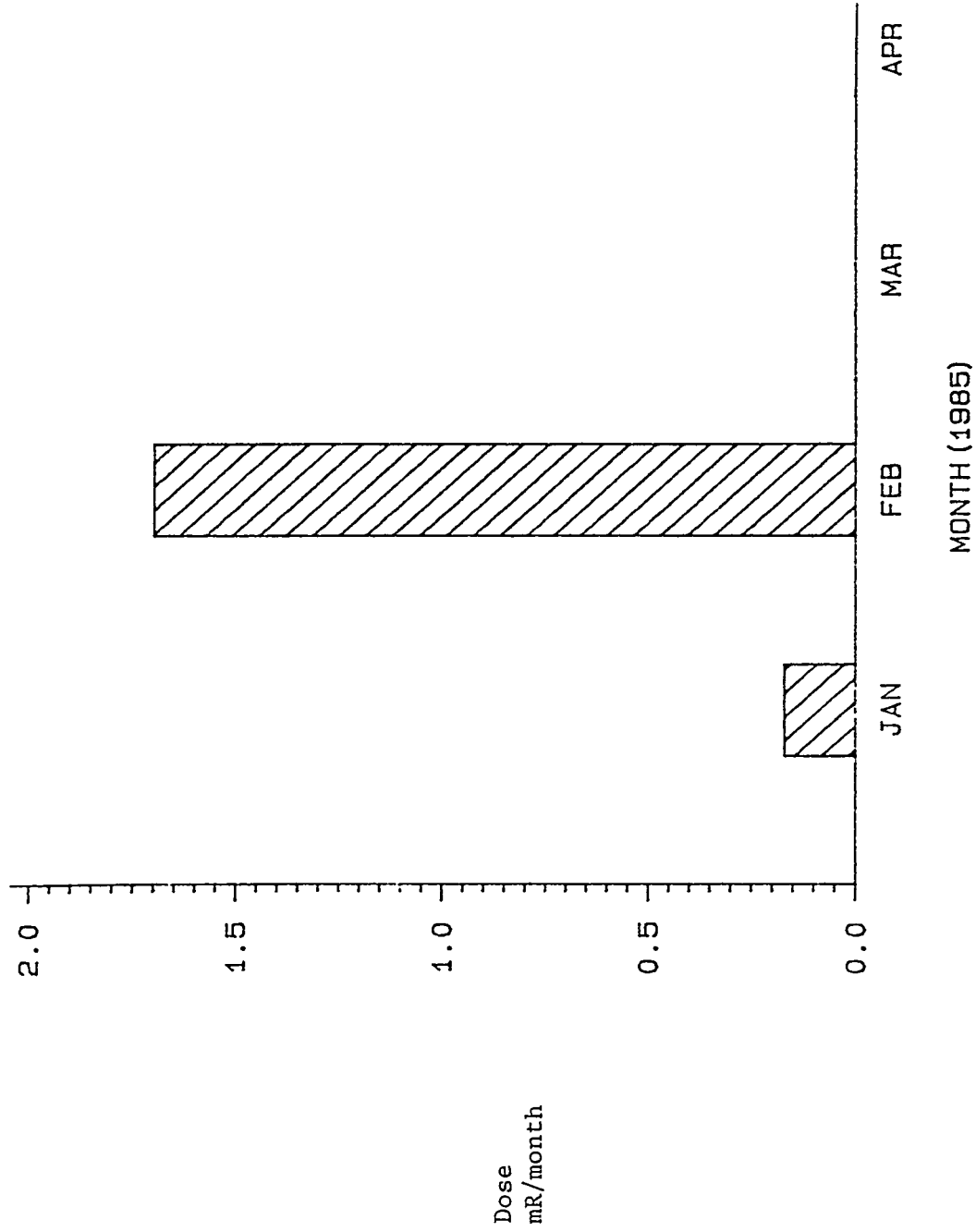


Fig. 1. Body Dose (mREM) Resulting from the Ingestion of Water at the Confluence of White Oak Creek and Clinch River.

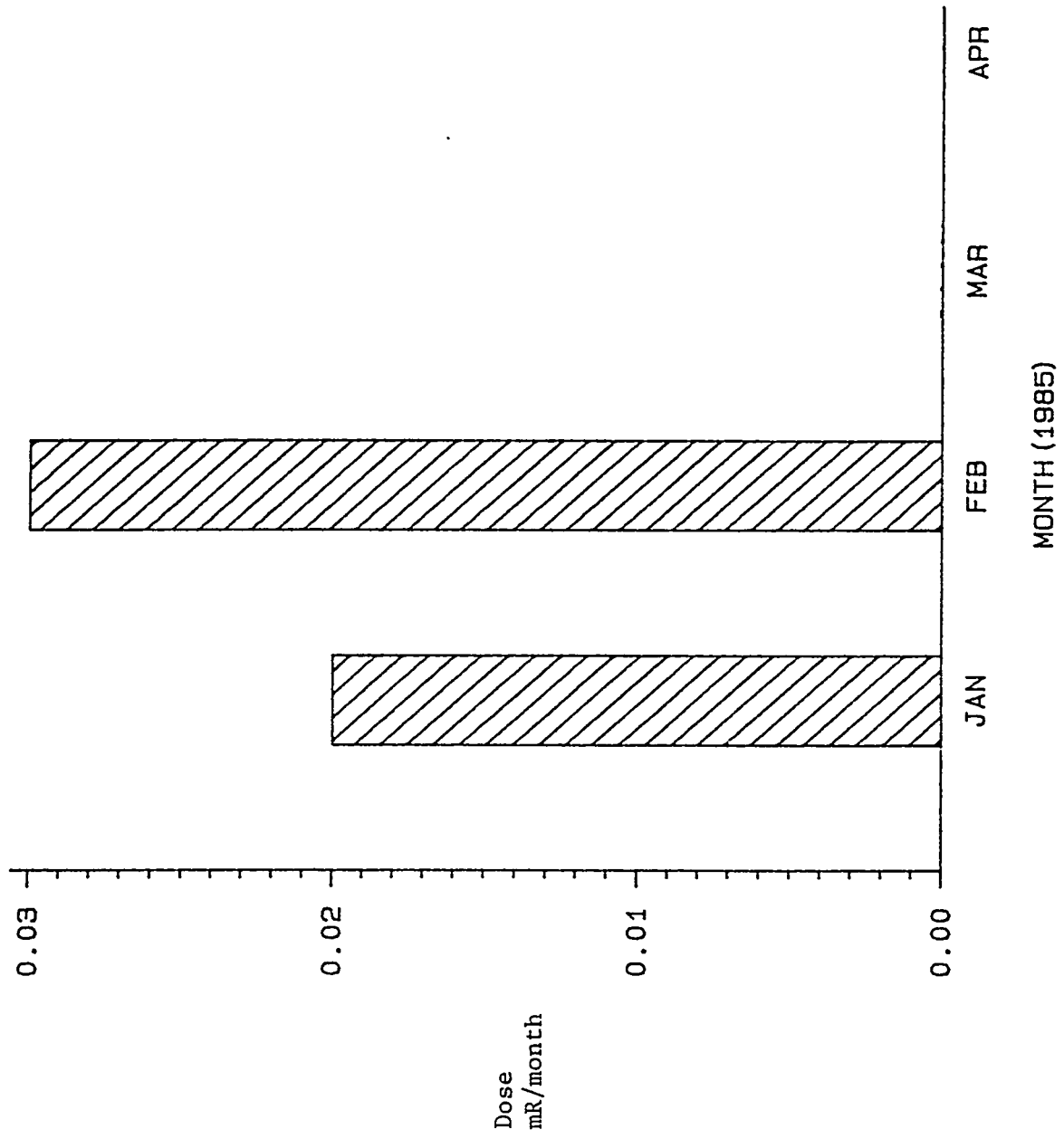


Fig. 2. Calculated Body Dose (mREM) Resulting from the Ingestion of Clinch River Water Below the Discharge of White Oak Dam.

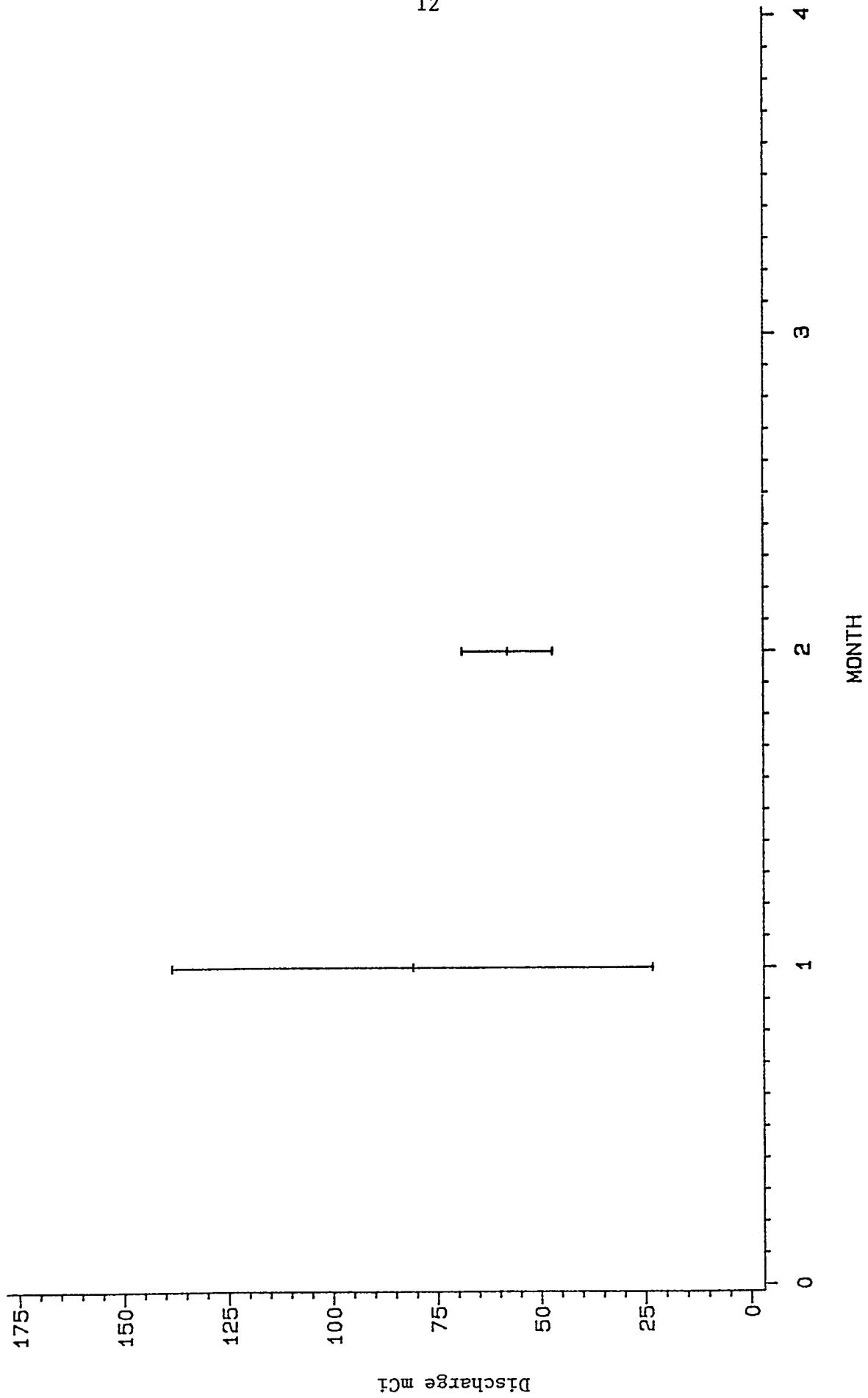


Fig. 3. Mean Weekly Discharges and 95% Confidence Intervals from White Oak Dam During 1985 --- Analysis of ^{90}Sr .

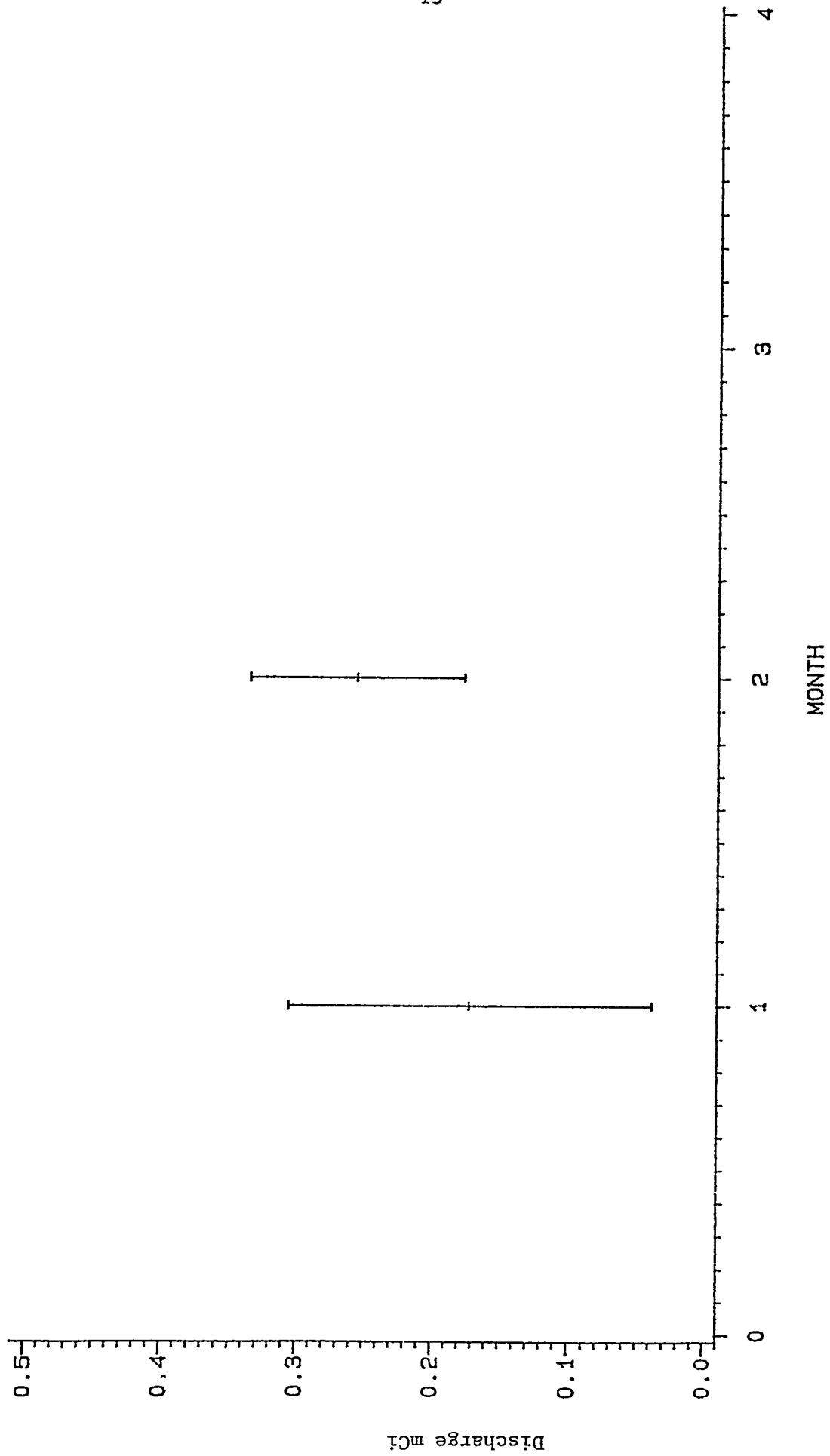


Fig. 4. Mean Weekly Discharges and 95% Confidence Intervals from White Oak Dam During 1985 — Analysis of TRU.

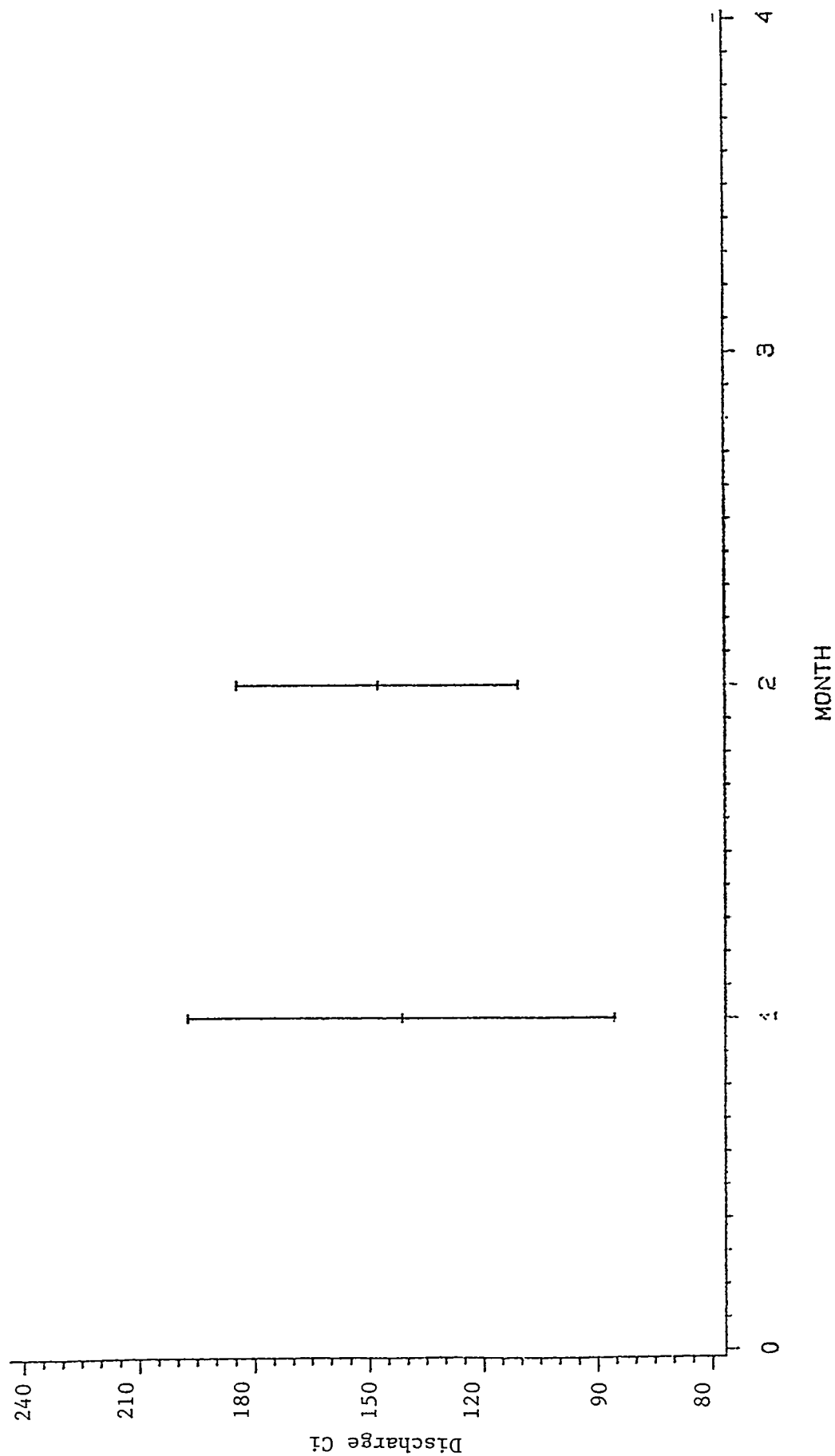


Fig. 5. Mean Weekly Discharges and 95% Confidence Intervals from White Oak Dam During 1985 --- Analysis of ^3H .

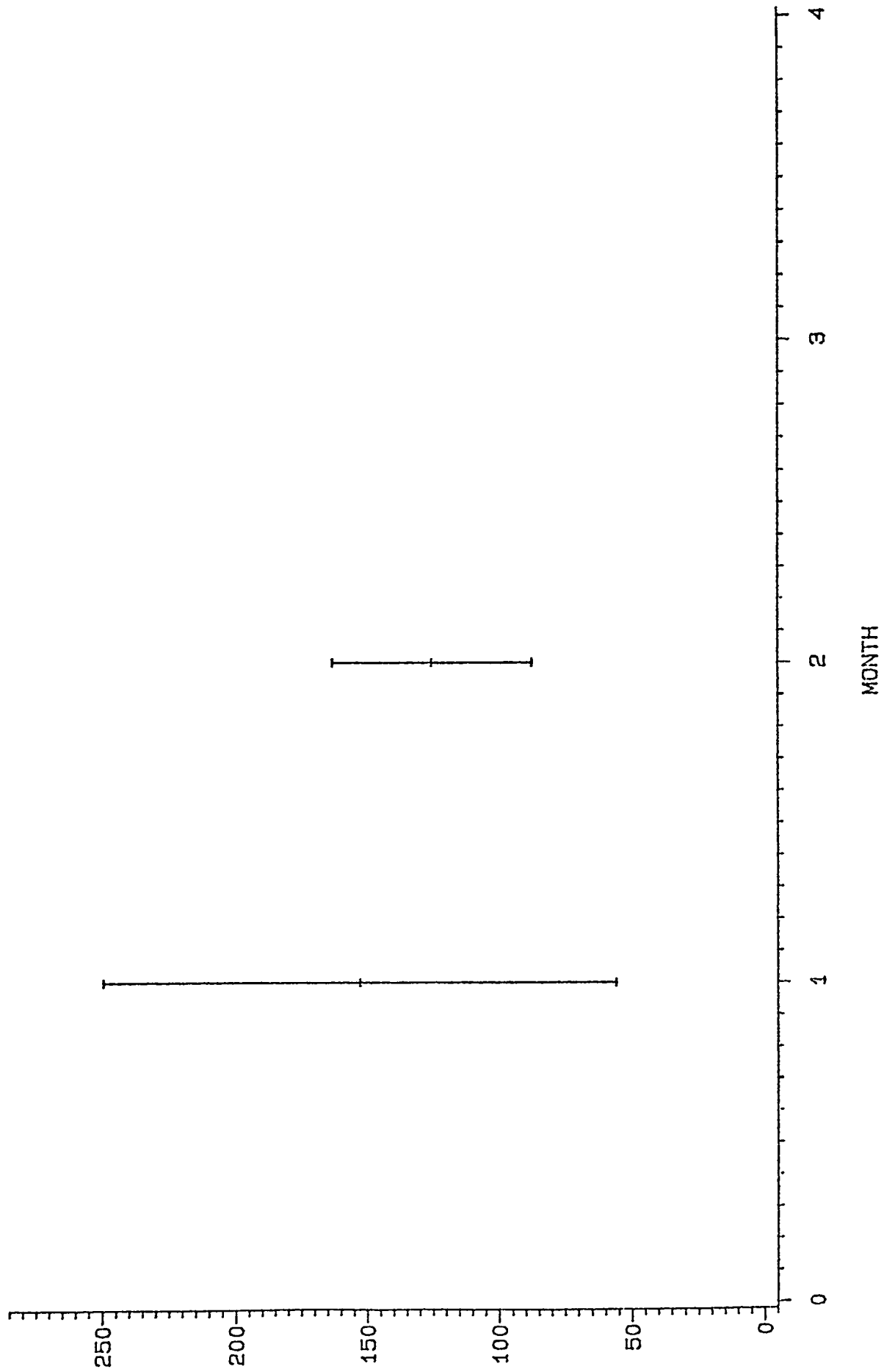


Fig. 6. Mean Weekly Discharges and 95% Confidence Intervals from White Oak Dam During 1985 -- Analysis of Gross Beta.

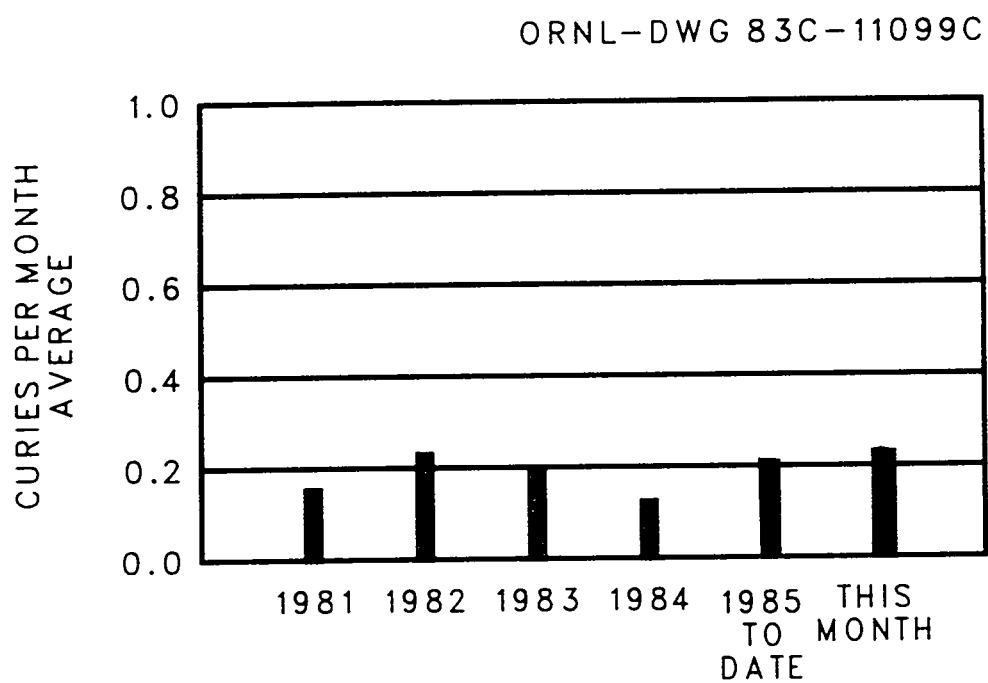


Fig. 7. ^{90}Sr Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 9)

ORNL-DWG 85C-13976

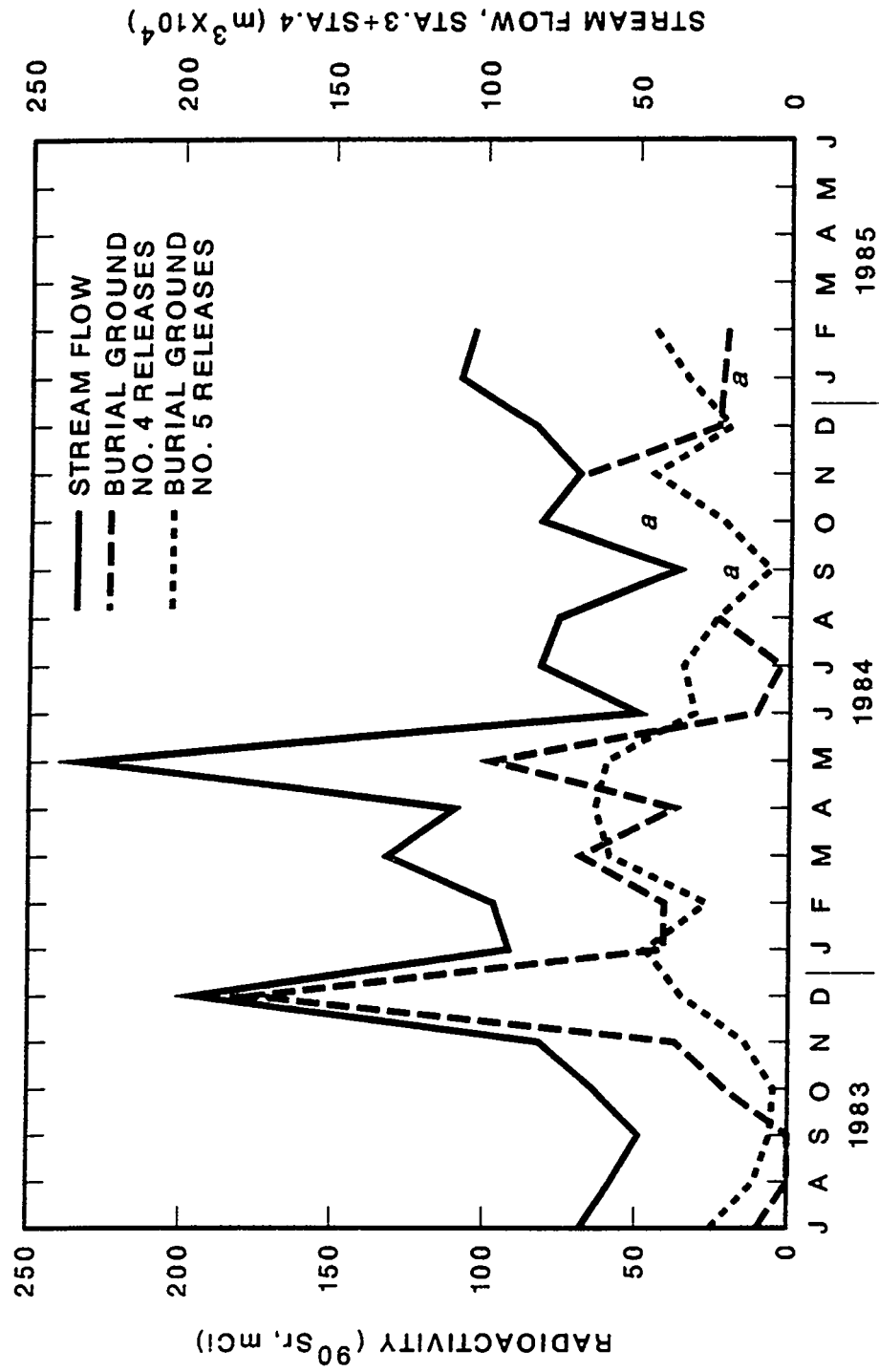


Fig. 8. Stream Flow and Radioactivity Released to White Oak Creek by Burial Grounds 4 and 5.

^a Not reported because of uncertainties with flow data & possible cross-contamination of sample

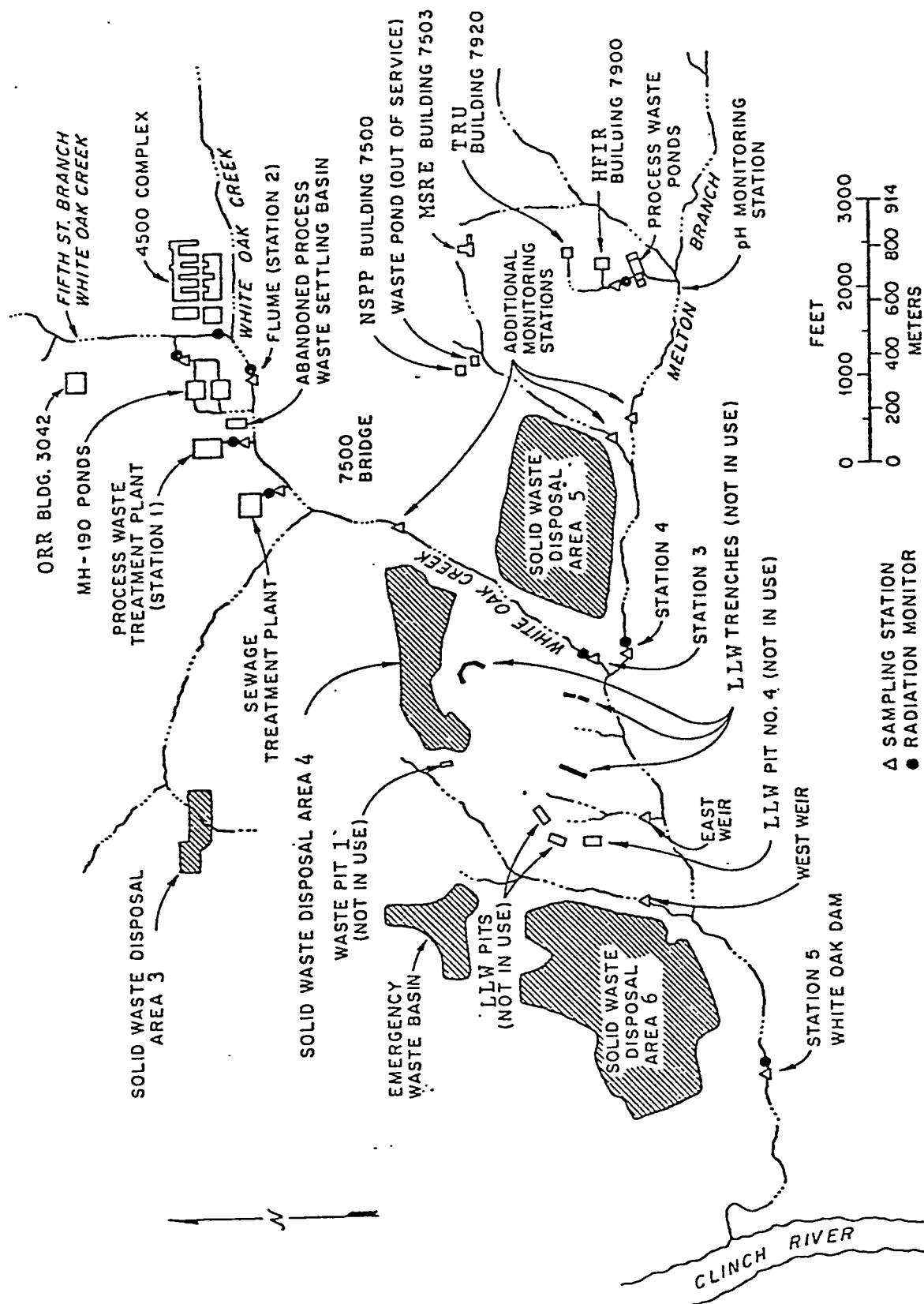


Fig. 9. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

ORNL-DWG 83C-11100C

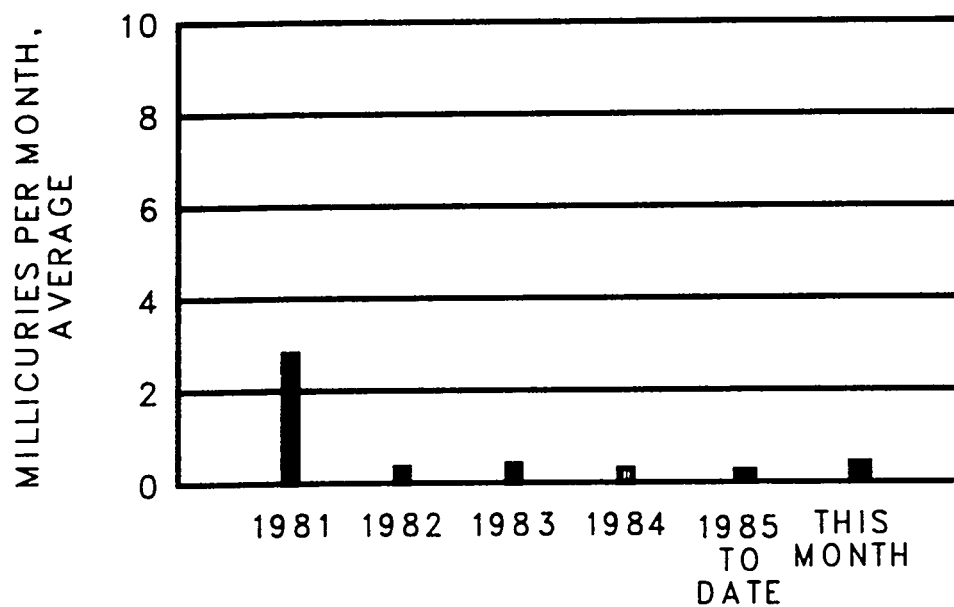


Fig. 10. ^{90}Sr Discharges in Waste from PWTP to White Oak Creek.

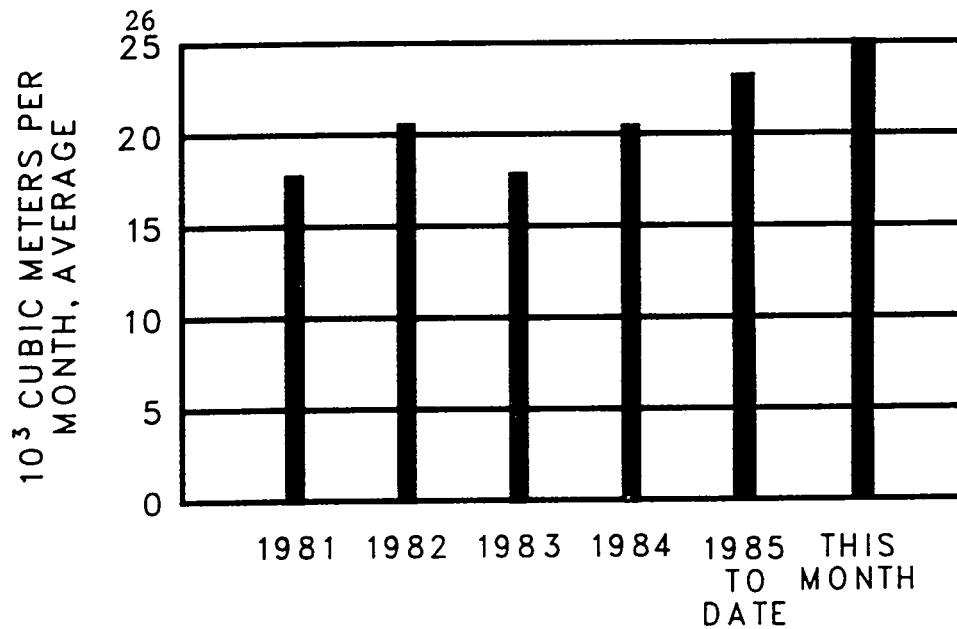


Fig. 11. Process Waste Volumes Treated in the PWTP.

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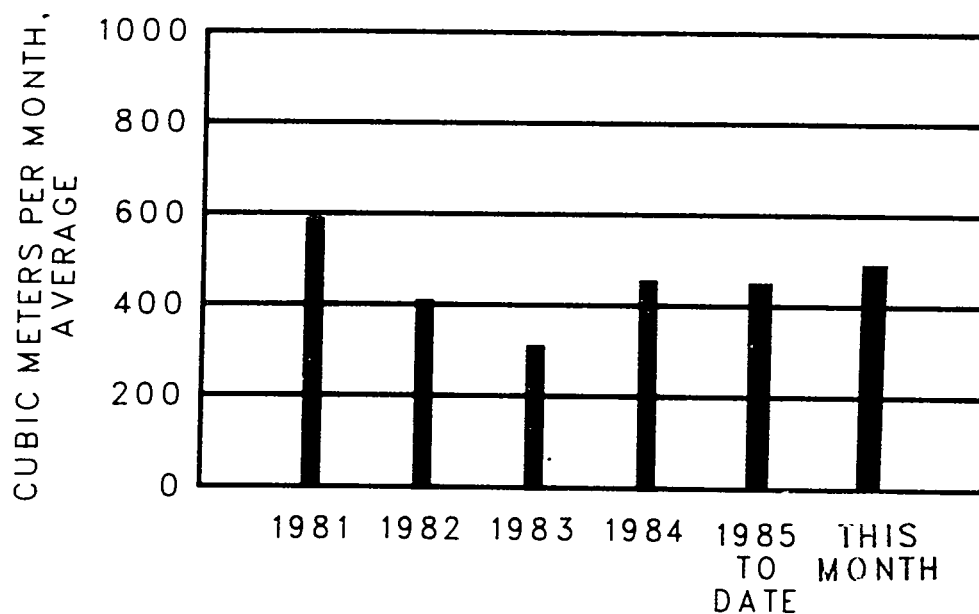


Fig. 12. Low-Level Waste Volume Generated this Month.

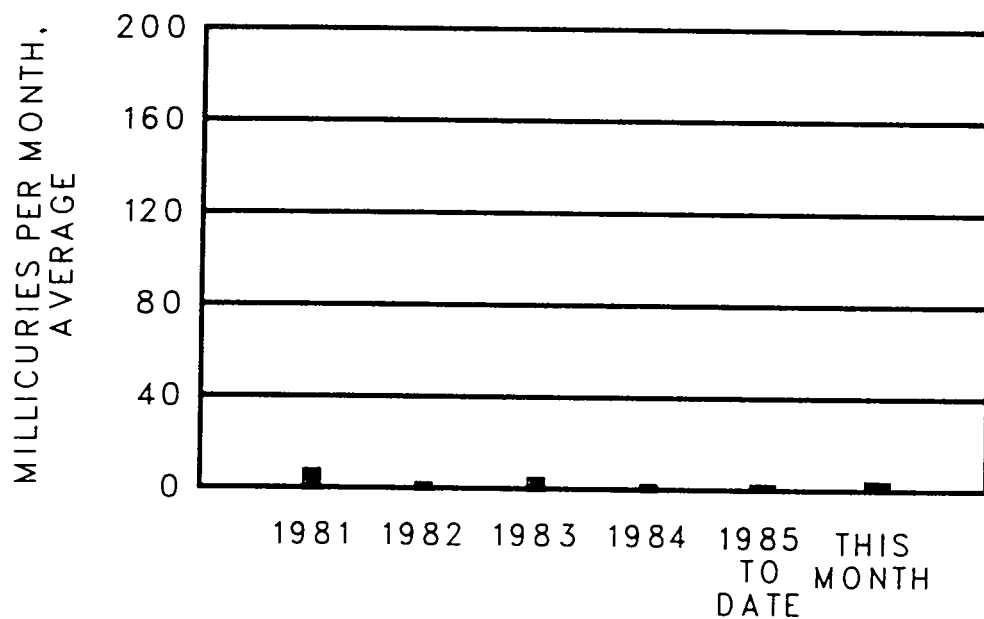


Fig. 13. Total Activity Released in Gaseous Waste (Mainly ^{131}I ; not including rare gases or other nonfilterable species). Maximum Permissible Operating Level is 13 Ci per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number ^a	Total Sr (Ci)	Gross Beta (Ci) ^b
Discharge from Bethel Valley Operations and Burial Ground 4	3	0.180	
Discharge from Melton Valley Operations and Burial Ground 5	4	0.053	
Discharge from Liquid LLW Pits and Trenches	East Weir	<0.0001	-----
Discharge from Liquid LLW Pits and Burial Ground 6	West Weir	0.002	-----
Total Discharge from All Sources		0.235	
White Oak Dam to Clinch River (EOS Measurements)		0.230	0.500

^aRefers to Fig. 9.

^bApproximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross beta activity is not sensitive to energies below that of ⁹⁰Sr.

Table 2. Process-Waste Discharges

	^{90}Sr Bq/L	Ci	% of Total	10^3 m^3	% of Total
Radioisotopes Processing Area (MH 234)	5300	0.626	38.6	4.37	21.3
Radioisotopes Processing Area (MH 114 minus MH 112)	---	0.177 ^a	10.9	1.30	6.3
Reactor Operations (MH 112)	31	0.005	0.3	5.65	27.5
Buildings 3503 and 3508 (MH 229)	0.44	<0.001	----	2.29	11.2
Buildings 3025 and 3026 (MH 149)	5.1	<0.001	----	1.57	7.7
Building 3019 (MH 25)	1300	<0.005	0.3	0.14	0.7
Waste Evaporator, Bldg. 2531 (MH 243)	640	0.032	2.0	1.85	9.0
Building 3525 (MH 235)	1.2	<0.001	----	1.17	5.7
Building 2026 (MH 240)	0.29	<0.001	----	0.73	3.6
Tank Farm Drainage	2000	0.778	47.9	1.44	7.0

^aThe activity entered the process-waste system with leakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

	Stack No.	^{131}I (mCi)	Filterable Particulate Activity ^a (μCi)	Inert Gases Ci
HLAL	2026	<0.001	<1	
Central Radioactive Gas Disposal Facilities	3039	<0.6	41	468
Radiochemical-Processing Pilot Plant	3020	0.001	<1	
MSRE	7512	<0.001	<1	
HFIR and TRU	7911	<1.2	4	83
Activity in Gases Released at X-10 Site		<1.8	45	
Building 4508 Ventilation Discharges Room 265			8×10^{-5}	
Building 5505 Discharges Glove Box			8.8×10^{-4}	

^aThese values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.